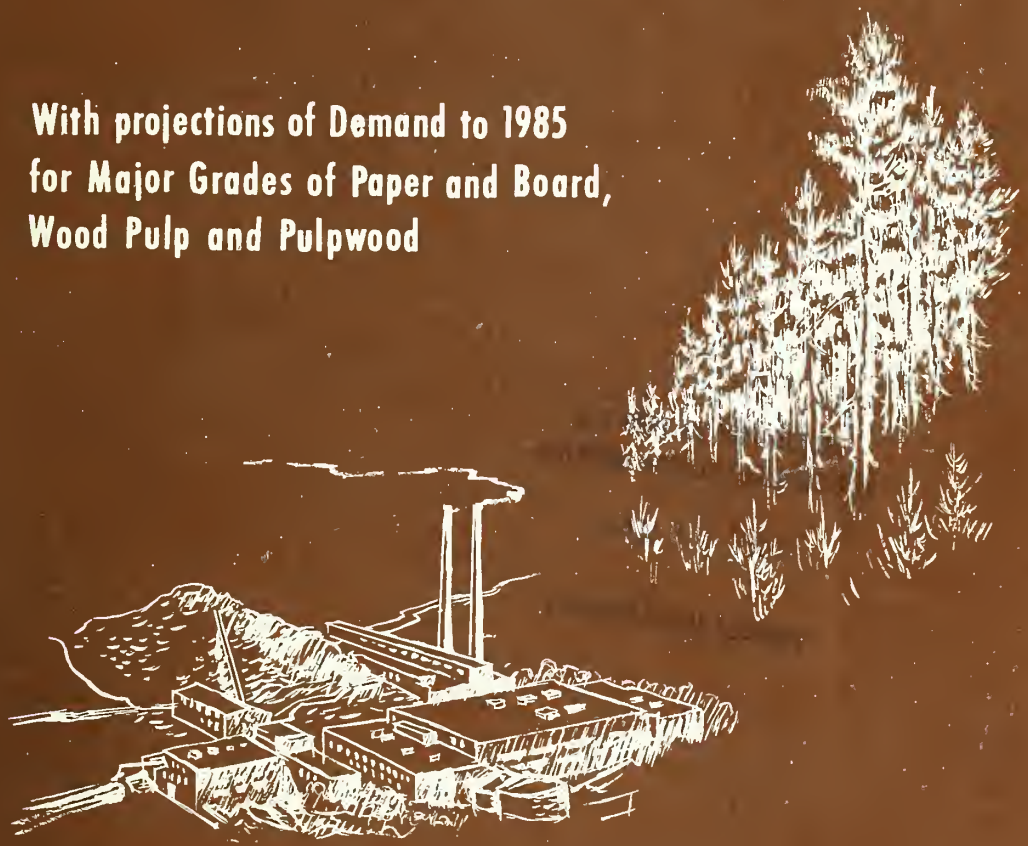
# USE OF REGRESSION EQUATIONS FOR PROJECTING TRENDS IN DEMAND FOR PAPER AND BOARD

With projections of Demand to 1985
for Major Grades of Paper and Board,
Wood Pulp and Pulpwood



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# USE OF REGRESSION EQUATIONS FOR PROJECTING TRENDS IN DEMAND FOR PAPER AND BOARD

With Projections of Demand to 1985
For Major Grades of Paper and Board,
Wood Pulp, and Pulpwood

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# PREFACE

This report presents a discussion of alternative ways of projecting longrun trends in demand; the results of an analysis of a comprehensive series of regression equations tested for use in projecting longrun trends in demand for major grades of paper and board; and projections of demand for paper and board, wood pulp, and pulpwood by 5-year periods to 1985. It also contains appendixes which show (1) the results of a graphical analysis of the relationships between changes in consumption of the major grades of paper and board and changes in selected independent variables (app. A); (2) the regression equations (including the *a* and *b* coefficients, errors of estimate, the coefficients or indexes of determination, and related statistical measures) tested for use in making longrun projections (app. A); (2) the regression equations on trends in production, trade, and consumption of paper and board, wood pulp, and pulpwood (app. C through G).

The discussion of the various ways of projecting longrun trends and the results of the statistical and graphical analyses are intended for use by other researchers involved in making longrun projections. The projections for paper and board, wood pulp, and pulpwood are intended as guides for decisions whose effects extend far into the future, such as those involving the construction of new pulp and paper plants or the acquisition and management of forests and forest lands.

In the past, population and income have been the principal determinants of consumption of paper and board. Thus the assumptions concerning future growth in these variables are of key importance in determining the level of projected demand. Because of this importance and the great uncertainty associated with future growth of population and income, two series of alternative projections of demand for paper and board, based on different population and income assumptions, have been worked out (see page 43). These illustrate the conditional nature of demand projections and provide a measure of their sensitivity to changes in population and income.

Most of the demand projections in this study, including those for wood pulp and pulpwood, are significantly above those published early in 1965 in the Forest Service report *Timber Trends in the United States*.[1] About two-thirds of the increase reflects the use of higher projections of gross national product and the related measures of economic activity. The remainder is attributable to the use of more recent data, which include the rapid rise in consumption of paper and board and general economic activity that took place in the 1963–66 period; further refinement in the projection methods; and an upward revision of projected exports of paper and board and wood pulp.

The new demand projections for pulpwood in 1985 are about 44 percent above those in the Timber Trends report. Given an increase in the cut of pulpwood of this magnitude, and assuming the cut of other timber products and levels of forest management would be about the same as assumed in the Timber Trends study, projected timber supplies would fall short of the total timber cut around 1980. This prospective supply-cut imbalance, along with the declines in the size and quality of trees, points to intensification in the competition for timber and increases in production and marketing costs beyond the levels which appeared likely in the Timber Trends analysis.

The pulp and paper industry can utilize the wood residues of other industries, small-sized low-quality timber, and the less desirable species. As a result, the wood supply and cost outlook is more favorable than for most other timber-using industries. Much will depend, however, on the success attained in adapting to the use of prospective wood supplies such as fine sawmill residues and hard hardwoods; technological improvements in logging, wood handling, and transportation; and levels of investment in forest management programs aimed at increasing timber supplies.

This study was part of the work authorized by Section 9 of the McSweeney-McNary Forest Research Act of May 22, 1928, as amended. This act authorized and directed the Secretary of Agriculture to cooperate with State and other

[1] U.S. Department of Agriculture, Forest Service. *Timber trends in the United States.* Forest Resource Rpt. 17, 235 pp., illus. 1965.

agencies: ". . . in making and keeping current a comprehensive survey of the present and prospective requirements for timber and other forest products in the United States."

Several colleagues and friends have made important contributions. These include G. Robinson Gregory, George Willis Pack Professor of Natural Resource Economics at the University of Michigan, who provided general advice and assistance: Perry R. Hagenstein of the Public Land Law Review Commission, Clark Row of the Forest Service, and I. Irving Holland, Professor of Forest Economics, University of Illinois, for their help on statistical problems: Gardner H. Chidester and his colleagues at the Forest Products Laboratory for guidance on prospective trends in the use of fibrous materials in the manufacture of paper and board: and George R. Armstrong, Associate Professor, Syracuse University; Kenneth P. Davis, Professor, Yale University; J. A. Guthrie, Director, Bureau of Economic and Business Research, Washington State University; Tom C. Mason, Director, Forest Products Division, Department of Commerce; Edward C. Muller, Marketing Analysis Department, St. Regis Paper Company; and Dr. Benjamin Slatin, Economist, American Paper Institute, who provided thoughtful reviews of the manuscript. I am also deeply indebted to H. R. Josephson, Director of the Forest Service's Division of Forest Economics and Marketing Research, for general direction, and Alice H. Ulrich for assistance in the preparation of the manuscript.

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# INTRODUCTION

The pulp and paper industry in the United States has been growing rapidly. In the last two decades, consumption and production of paper and board have increased some 2½ times. The output of wood pulp, nearly all of which is used in the manufacture of paper and board, has more than tripled. The cut of pulpwood, the raw material for making wood pulp, has shown proportional growth, and this product now accounts for over a quarter of the timber harvested from the Nation's forests.

Because of the rapid growth in demand for paper and board, wood pulp, and pulpwood, businessmen and Government administrators concerned with planning plant expansions in the pulp and paper industry or with the adequacy of timber resources have felt a continuing need for appraisals of future trends in demand. In response to this need, a series of studies of longrun demand have been prepared by public and private agencies.[2] In these and related studies such as those conducted by the Food and Agriculture Organization of the United Nations for Western Europe and other regions of the world,[3] the usual procedure has been to make projections of demand for the major grades of paper and board—the end products of the industry. These projections have then been converted into equivalent demands for wood and pulpwood.

In most of these recent studies the term "projected demand" has been defined as the volume of paper and board that will be consumed in the projection years if the explicit and implicit assumptions concerning the changes in population, economic activity, prices, and other determinants of consumption are realized.[4] This definition is also used here. Such usage is at variance, however, with technical economic terminology where demand is used to mean the curve or schedule which indicates the quantities of a commodity that would be consumed (or purchased) through a range of prices.[5]

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[2] Recent major studies in the United States which have contained longrun projections of demand for paper and board include:

U.S. Department of Agriculture, Forest Service. *Timber trends in the United States.*

_____ *Timber resources for America's future.* Forest Resource Rpt. 14. 1958.

Guthrie, John A., and Iulo, William. *Some economic aspects of the pulp and paper industry with particular reference to Washington and Oregon.* Pullman: Washington State University. 1963.

U.S. Congress, House Committee on Interstate and Foreign Commerce. *Pulp, paper and board supply-demand.* Union Calendar 292, House Rpt. 693, 88th Cong., 1st sess. 1963.

Resources for the Future, Inc. *Resources in America's future, patterns of requirements and availabilities, 1960–2000.* Baltimore: Johns Hopkins Press. 1963.

Guthrie, John A., and Armstrong, George R. *Western forest industry, an economic outlook.* Baltimore: Johns Hopkins Press. 1961.

Stanford Research Institute. *America's demand for wood, 1929–1975.* Stanford, 1954.

[3] United Nations Food and Agriculture Organization. *European timber trends and prospects, a new appraisal, 1950–1975.* New York, 1964.

_____ *Latin American timber trends and prospects.* New York, 1963.

_____ *Pulp and paper prospects in Western Europe.* Rome, 1963.

_____ *Pulp and paper prospects in Asia and the Far East.* Bangkok, 1962.

_____ *Timber trends and prospects in the Asia–Pacific Region.* Geneva, 1961.

_____ *World demand for paper to 1975.* Rome, 1960.

_____ *Pulp and paper prospects in Latin America.* New York, 1955.

_____ *World pulp and paper resources and prospects.* New York, 1954.

[4] There are three basic kinds of assumptions underlying the longrun projections of demand for timber products in most of the recent studies. These are (1) the assumptions concerning the "demand shifters" such as population and economic activity which determine the horizontal movements of the demand curve, (2) the assumptions (usually implicit) concerning the form (elasticity) of the demand curve, and (3) the assumptions concerning the supply curve. Assumptions about the supply curve are usually expressed as a price assumption which indicates that no significant change is anticipated in the relative price of the product in question in the projection period. This implicitly assumes a highly elastic longrun supply curve over the range in which demand is expected to vary.

[5] Projected demand in any projection year is a point on a demand curve for the given grade of paper or board. Once the form of the curve is defined, the quantities that will be purchased at various prices can be determined. However, the general form of the demand curve is still largely unknown for the various timber products, including paper and board.

# ALTERNATIVE WAYS OF PROJECTING LONGRUN TRENDS IN DEMAND

Most of the longrun projections of demand for paper and board shown in the recent U.S. and FAO studies have been derived from regression equations. These equations have been used to project the historical relationship between consumption of various grades of paper and board and one or more independent variables, such as population or income, which were important determinants of demand in the past and for which estimates of future values were available. Such equations are relatively simple projection models. In other studies concerned with demand and longrun projections [6] both more elaborate and simpler alternatives have been used or suggested.

There are almost endless variations in models or ways of projecting longrun trends in demand. However, they can be grouped into four broad types: the input-output model, the multiequation model, the regression model, and the graphic model. This part of the report begins with a brief discussion of these alternative models or ways of making longrun projections. This is followed by an analysis of a comprehensive series of regression equations that were tested for possible use in projecting longrun trends in demand for the 11 major grades of paper and board listed below:[7]

Newsprint
Groundwood paper
Book paper, coated and uncoated
Fine paper
Coarse and industrial paper
Sanitary and tissue paper
Construction paper
Container board
Bending board
Building board
Other board

### *The input-output model—a complicated model still in the developmental stages*

The most complicated model that has been suggested for use in projecting longrun trends in demand for paper and board and other products is the input-output or Leontief model.[8] This model shows the interrelationships among the various sectors of the economy through the medium of an input-output table such as that schematically illustrated in figure 1. In this table each sector of the economy is represented by a horizontal row and a vertical column. The column for a sector shows its purchases of goods and services from all other sectors. The row for a sector shows its distribution of output to all other sectors. Each number in a row also appears in a column and indicates how the output of each sector is the input to another sector. This double-entry bookkeeping reveals how the various sectors of the economy are linked together by the flow of trade.

The links (coefficients) between the paper and allied products sector and all other sectors of the economy are illustrated in part by the data in row 7 and in column 7 of figure 1. The sum of the numbers in row 7 indicates that the gross output of the sector was $7.90 billion. the remaining numbers in this row show how this output was distributed among the other sectors of the economy. For example, $1.08 billion was shipped to the printing and publishing sector—a major market for various grades of paper. Purchases of goods and services from other sectors are shown in column 7. A substantial amount—$2.20 billion—was payments to households in the form of wages, salaries, and dividends.

The links among the sectors of the economy, as shown in an input-output table, provide a useful tool for analyzing and calculating the shortrun effects of a change in the gross national product, or any of its components, on the value of the output of any sector of the economy such as the paper and allied products industry. By using supplementary data on

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[6] Recent examples of such studies are:
McKillop, William. *Consumption and price of forest products in the United States: an econometric study of past determinants and future levels.* Ph.D. dissertation. Berkeley: School of Forestry, University of California. 1965.
Arthur D. Little, Inc. *Ohio River Basin comprehensive survey, appendix B, projective economic study.* Cambridge, Mass., 1964.
Riihinen, Päiviö. *Sales of newsprint in Finland, 1949–59: models for short term forecasting.* Acta Forestalia Fennica 74. Helsinki: Society of Forestry in Finland. 1962.
Gregory, G. Robinson. *A statistical investigation of factors affecting the market for hardwood flooring.* Forest Sci. 6 (2): 123–134. 1960.
Ezekiel, Mordecai, and Fox, Karl A. *Methods of correlation and regression analysis.* New York: John Wiley and Sons. 1959.
Foote, Richard J. *Analytical tools for studying demand and price structures.* U.S. Dept. Agr. Handb. 146. 1958.
Wold, Herman, and Jureen, Lars. *Demand analysis, a study in econometrics.* New York: John Wiley and Sons. 1953.

[7] Definitions of each grade of paper and board and other technical names and terms used are given in appendix H.

[8] This model was developed by Wassily W. Leontief who constructed input-output tables for the United States for 1919, 1929, and 1939. These tables were published in Leontief's work, *The structure of the American economy.* Cambridge: Harvard University Press, 1941. The most recent set of input-output tables has been prepared by Morriss R. Goldman, Martin L. Marimout, and Beatrice N. Vaccara. *The interindustry structure of the United States, a report on the 1958 input-output study.* Surv. Cur. Bus., U.S. Dept. Comm., Office of Bus. Econ. 44 (11): 10–29. 1964.

## Schematic model of an input–output table

| INDUSTRY INPUT | 1 AGRICULTURE & FISHERIES | 2 FOOD & KINDRED PRODUCTS | 3 TEXTILE MILL PRODUCTS | 4 APPAREL | 5 LUMBER & WOOD PRODUCTS | 6 FURNITURE & FIXTURES | 7 PAPER & ALLIED PRODUCTS | 8 PRINTING & PUBLISHING | 9 CHEMICALS | 10 PRODUCTS OF PETROLEUM & COAL | OTHER INDUSTRIES | 38 INVENTORY CHANGE (ADDITIONS) | 39 FOREIGN COUNTRIES (EXPORTS TO) | 40 GOVERNMENT | 41 PRIVATE CAPITAL FORMATION (GROSS) | 42 HOUSEHOLDS | TOTAL GROSS OUTPUT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 AGRICULTURE AND FISHERIES | 10.86 | 15.70 | 2.16 | 0.02 | 0.19 | – | 0.01 | – | 1.21 | – | | 1.01 | 1.28 | 0.57 | 0.02 | 9 92 | 44.26 |
| 2 FOOD AND KINDRED PRODUCTS | 2.38 | 5.75 | 0.06 | 0.01 | * | * | 0.03 | * | 0.79 | * | | 0.88 | 1.80 | 0.73 | – | 23.03 | 40.30 |
| 3 TEXTILE MILL PRODUCTS | 0.06 | * | 1.30 | 3.88 | * | 0.29 | 0.04 | 0.03 | 0.01 | * | | 0.06 | 0.92 | 0.10 | 0.02 | 1.47 | 9 84 |
| 4 APPAREL | 0.04 | 0.20 | – | 1.96 | – | 0.01 | 0.02 | – | 0.03 | – | | 0.21 | 0.30 | 0.28 | * | 9.90 | 13.32 |
| 5 LUMBER AND WOOD PRODUCTS | 0·15 | 0.10 | 0.02 | * | 1.09 | 0.39 | 0.27 | * | 0.04 | 0.01 | | 0.17 | 0.17 | 0.01 | 0.04 | 0.07 | 6.00 |
| 6 FURNITURE AND FIXTURES | – | – | 0.01 | – | – | 0.01 | 0 01 | – | – | – | | 0.08 | 0.03 | 0.05 | 0.57 | 1.46 | 2.89 |
| 7 PAPER AND ALLIED PRODUCTS | * | 0.52 | 0.08 | 0.02 | * | 0.02 | 2.60 | 1.08 | 0.33 | 0.11 | | 0.04 | 0.15 | 0.06 | – | 0.34 | 7.90 |
| 8 PRINTING AND PUBLISHING | – | 0.04 | * | – | – | – | – | 0.77 | 0.02 | – | | * | 0.07 | 0.16 | 0.09 | 1 49 | 6.45 |
| 9 CHEMICALS | 0.83 | 1.48 | 0.80 | 0.14 | 0.03 | 0.06 | 0.18 | 0.10 | 2.58 | 0.21 | | 0.30 | 0.81 | 0.19 | – | 1.96 | 14.05 |
| 10 PRODUCTS OF PETROLEUM AND COAL | 0.46 | 0.06 | 0.03 | * | 0.07 | * | 0.06 | * | 0.32 | 4.83 | | 0.06 | 0.68 | 0.18 | * | 2.44 | 13.67 |
| OTHER INDUSTRIES | INTERMEDIATE INDUSTRY TRANSACTION MATRIX | | | | | | | | | | | | | | | | |
| 38 INVENTORY CHANGE (DEPLETIONS) | 2.66 | 0.40 | 0.12 | 0.19 | * | 0.01 | 0.09 | 0.03 | 0.14 | 0.01 | | | | | | | |
| 39 FOREIGN COUNTRIES (IMPORTS FROM) | 0.69 | 2.11 | 0.21 | 0.28 | 0.18 | 0.01 | 0.62 | 0.01 | 0.59 | 0.26 | | | | | | | |
| 40 GOVERNMENT (TAXES) | 0.81 | 1.24 | 0.64 | 0.38 | 0.34 | 0.11 | 0.50 | 0.34 | 0.76 | 0.78 | | | | | | | |
| 41 PRIVATE CAPITAL FORMATION (GROSS) | DEPRECIATION AND OTHER CAPITAL CONSUMPTION ALLOWANCES ARE INCLUDED IN HOUSEHOLD ROW | | | | | | | | | | | | | | | | |
| 42 PAYMENTS TO HOUSEHOLDS | 19.17 | 7.05 | 3.34 | 4 24 | 2.72 | 1.12 | 2.20 | 3.14 | 3.75 | 5.04 | | | | | | | |
| TOTAL GROSS OUTLAYS | 44.26 | 40.30 | 9.84 | 13.32 | 6.00 | 2.89 | 7.90 | 6.45 | 14 05 | 13.67 | | | | | | | |

NOTE: Figures in billions of dollars.

Note: In the vertical column at left the entire economy is broken down into sectors; in the horizontal row at the top the same breakdown is repeated. When a sector is read horizontally, the numbers indicate what it ships to other sectors. When a sector is read vertically, the numbers show what it consumes from other sectors. The asterisks stand for sums less than $5 million. Totals may not check due to rounding.

Source: Derived from a table published by Wassily W. Leontief "Input-Output Economics," Scientific American, Vol. 185 No. 4 (November 1951), 16 — 17.

FIGURE 1.

physical output per unit of value, it is also possible to convert value output data into physical units such as tons of paper and board.

Using the simplest procedures that have been developed to date, longrun projections of demand for paper and board can be derived by estimating (1) final demand in the projection years and (2) the series of links between final demand and the paper and allied products sector of the economy.[9] The problems associated with obtaining longrun estimates of final demand are common to most methods of projecting future demands for a product such as paper and board. That of estimating the links, however, in some future year is unique and represents a major problem area in making an input-output table operational for longrun projection. In fact, there are not enough historical data available to provide an adequate basis for projecting longrun changes in the links between final demand and the various sectors of the economy.[10] Thus, at this time the model is not a practical choice for projecting longrun trends in demand for paper and board.

[9] One of the input-output tables for 1958 (Goldman, et al., op. cit.) contains coefficients that measure the total requirements (direct and indirect) from each sector of the economy per dollar of delivery to final demand (see table 3, pp. 16–17). These coefficients (links) can be used directly to calculate the impact on the various sectors of the economy from any given change in final demand.

[10] The basic data and techniques for using the input-output model for making longrun projections are now being developed in the Departments of Commerce and Labor. It will probably be some time, however, before this model is fully operational.

The input-output model offers some interesting possibilities for use in longrun demand studies involving countries at different stages of development. It may be that the coefficients measuring the links among the sectors of the economy are roughly similar for countries at comparable stages of development. If this is so, input-output tables can be used to project demands in countries at various stages of development—much as cross-sectional data on income have been used in several recent studies.

### *A multi-equation model—simpler than an input-output model but problems are involved in operational use*

Although all sectors of the economy are interrelated in some degree, as indicated by the links in an input-output table, only a few sectors are important determinants of demand for a particular product such as a major grade of paper or board. Thus, it is possible to use a fairly restrictive multi-equation system in which only the important determinants are included in making longrun projections.

A multi-equation (2 or more equations) system can be either recursive or simultaneous. A recursive system is illustrated by the following equations: [11]

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3$$
$$S = a' + b'_1 X'_1 + b'_4 X'_4 + b'_5 X'_5$$
$$P = a'' + P_{-1} + b''_6 X''_6 + b''_7 X''_7 + b''_8 X''_8$$

where:

$Y$ = annual demand for paper in tons.
$X_1$ = per capita gross national product.
$X_2$ = the Federal Reserve index of industrial production.
$X_3$ = the deflated wholesale price index of paper (deflated by the consumer price index).
$S$ = annual new supply of paper in tons.
$X'_1 = X_1$ of the demand equation.
$X'_4$ = the deflated wholesale price index of paper lagged 1 year.
$X'_5$ = the deflated wholesale price index of wood pulp lagged 1 year.
$P$ = the deflated wholesale price index of paper.
$P_{-1}$ = the deflated wholesale price index of paper lagged 1 year.
$X''_6 = (S_{-1} - D_{-1})$ or the difference between last year's production and shipments of paper in tons.
$X''_7$ = the level of paper inventories in tons lagged 1 year.
$X''_8 = (P - P_{-1})$ the annual change in the deflated wholesale price index of paper.

In this system of equations demand is treated as a function of consumer-related variables; supply as a function of producer-related variables; and price as the factor which causes demand and supply to move toward equilibrium. These equations, with the lagged variables, form a recursive causal chain which can be used to project demand year by year through any desired length of time.

A simultaneous system is illustrated by the following equations: [12]

$$Y = f_1 (P)$$
$$S = f_2 (P)$$
$$P = f_3 (Y, S)$$

where:

$Y$ = annual consumption of paper in tons.
$S$ = annual production of paper in tons.
$P$ = the price of paper.
f = a specified functional relationship between the variables.

The important difference between this simultaneous system and the recursive system is the simultaneous influences between variables. Price, for example, is simultaneously determined with demand and supply. In contrast, in the recursive system price is a dependent variable and variations in price reflect disequilibrium between consumption and production, in accord with classical price theory.

Both systems of equations have been used in making projections. However, Wold and others [13] have argued on pragmatic and theoretical grounds that the recursive system is applicable to and preferable for use in most of the economic problems for which the simultaneous system has been utilized. The formulation and solution of a recursive system is relatively simple in comparison with a simultaneous system.

In both the recursive and simultaneous systems of equations, distortions in the relationships among variables caused by random influences in the time period used as the base or beginning point for making projections will be magnified as they are carried through the projection period.[14] The cumulative effect is likely to be very large over a long period and is a major and unresolved problem in using multi-equation models for longrun projections. In addition, the projections obtained from these systems are valid only where the price elasticity coefficients at the intersection of the demand and supply curves in the projection periods are close to those in the time period used as the base for the projections.

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[11] Adapted from a model prepared by Gregory, op. cit. p. 127, for short-range forecasting in the hardwood flooring market. This adaptation is intended only as an illustration. It has not been tested to see if it is operational for making longrun projections of demand for paper and board. Presumably it would not be operational because many of the variables included, especially price, have not had a measurable impact on consumption.

[12] For information on fitting systems of two or more simultaneous equations and computational methods, see Ezekiel and Fox, op cit.; and Joan Friedman, and Richard J. Foote. *Computational methods for handling systems of simultaneous equations.* U.S. Dept. Agr. Handb. 94. 1957.

[13] Wold and Jureen, op. cit., and Ezekiel and Fox, op. cit.

[14] For example, see Richard J. Crom, and Wilburn R. Maki. *Adjusting dynamic models to improve their predictive ability.* Jour. Farm. Econ. 47 (4) : 963–972. 1965.

### *The single equation or regression model—widely used for making projections*

In making longrun projections for a single dependent variable, such as a grade of paper or board, and where the projected independent variables which are important determinants of demand are specified, it is possible to use a single equation of the general form $Y = f(X)$ where:

$Y$ = the dependent variable.
$X$ = the independent variable or variables.
$f(X)$ = a specified form of relationship between the dependent and independent variables.

This model, commonly called a regression equation, has been frequently used for making longrun projections.

A regression equation mathematically describes the functional relationship [15] between dependent and independent variables. Such a functional relationship [16] is illustrated in figure 2 [17] which, by means of a scatter diagram, shows the per capita newsprint consumption associated with per capita disposable personal income in all the years 1929–62. It is evident that the points are arranged in a definite pattern or band. A closer examination also indicates that annual changes in per capita newsprint consumption and per capita disposable personal income have generally been in the same direction. Whenever these two things occur, it is evidence that a functional relationship exists between the variables although nothing is implied about causality. Under such circumstances, when the value of one variable is known, it is possible to estimate the likely value of the other variable.

Although it is possible to estimate values for either variable when the other is known, per capita newsprint consumption would not ordinarily be used as the independent variable for estimating per capita disposable personal income because the relationship is not causal, i.e., a change in per capita newsprint consumption cannot cause an appreciable change in per capita income. On the other hand, per capita disposable personal income, which is a measure of the buying power of the final consumers of newsprint, is logically one of the primary determinants of per capita newsprint consumption. Thus the relationship is both causal and functional, and per capita disposable personal income is one logical choice as an independent variable for estimating per capita newsprint consumption—the dependent variable.

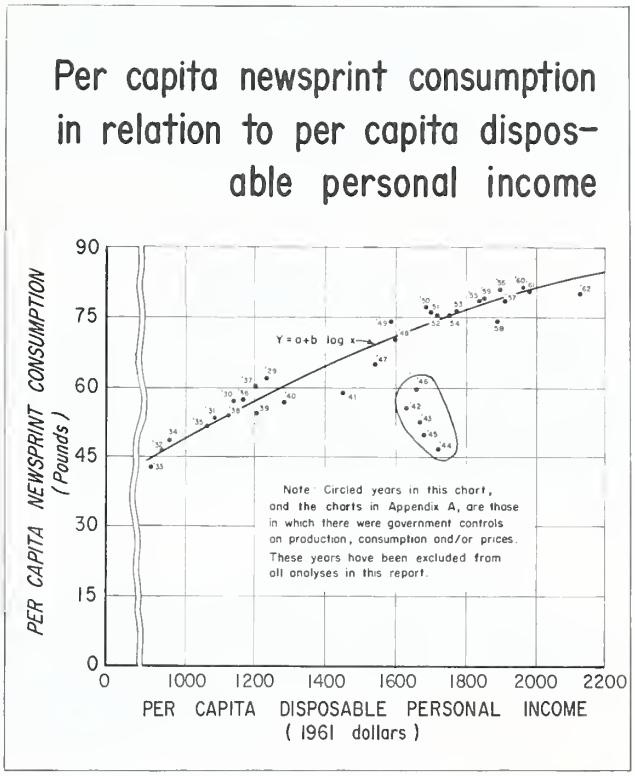


FIGURE 2.

A regression equation is an equation for a line (see the line in figure 2) and is thus a precise description of a relationship between variables. Economic data rarely have a precise relationship because the actual observations, as in figure 2, are usually scattered around the line described by the regression equation. In general, the closer the observations to the line the greater the confidence in the estimates derived from the equation, particularly if they are in the range of the observations used in establishing the relationship.

Longrun projections usually extend well beyond the range of the base observations, and it

[15] This means only that there is some definite relationship between the two variables. It implies nothing about causality, i.e., that changes in one variable cause changes in the other variable.

[16] Strictly speaking the relationship is *stochastic* rather than *functional* because it contains a set of unexplained residuals or error terms—the common case in dealing with economic data.

[17] The data plotted in figure 2 are time series data which show the relationship between per capita newsprint consumption and per capita disposable personal income in the period 1929–62. The Food and Agriculture Organization of the United Nations in its studies of demand for paper and board has utilized similar diagrams which show the relationship between consumption and income in different countries in a given year (see *World demand for paper to 1975*, and *Pulp and paper prospects in Western Europe*). This cross-sectional analysis is particularly well adapted for use in studies concerned with projections of demand for a number of different countries where income, and the associated consumption, are known. It is not adaptable to the detailed time series data available in the United States.

is thus necessary to assume that the historical relationship between the variables will continue during the projection period. Because relationships between economic variables are subject to change, this assumption is an important element of uncertainty in demand projections extending as far in the future as 1985.

### *The graphic model—the simplest way to make a projection*

Some relationships, such as that between time and the velocity of a falling body, are fairly exact and should logically be expressed by a mathematical equation. However, many of the relationships between economic series, such as those between the consumption of a grade of paper and income, are not very exact or are so complex that they cannot be represented in elementary algebraic terms. Under such circumstances, and especially where there are no logical reasons for believing a definite kind of relationship exists, a freehand curve (the graphic model) fitted by eye to the data, may provide a satisfactory description of the relationship and as good a basis for estimating one variable from another as a mathematical model.[18] In other problems there are not enough data available to permit the determination of a mathematical relationship. Under these conditions a freehand curve is the only practical means of describing the relationship. The effective use of the graphic model is largely dependent upon the knowledge and judgment of the analyst.

# ANALYSIS OF A SERIES OF REGRESSION EQUATIONS TESTED FOR PROJECTING LONGRUN TRENDS IN DEMAND FOR PAPER AND BOARD

### *Regression equations have been widely used in making longrun projections but little attention has been given factors which determine projection levels*

For several decades the regression model has been almost universally used for projecting longrun trends in demand for paper and board. There are several reasons for this choice. First, it is well suited for use with the detailed time series data that are available on consumption of paper and board by major grades and on population, gross national product, and other related measures of economic activity. Second, it is generally understood by researchers in Government and industry and can be used for making longrun projections without computers or other elaborate data processing equipment. And finally, its predictive reliability seems to be as good as any alternatives that are presently available for operational use.

Although the regression model has had wide use over an extended period of time in making longrun projections of demand, very little attention has been given to the following factors that affect the projected values of the dependent variables.

1. The independent variables used in making the projections.[19]

2. The units used in measuring the variables, i.e., the use of per capita or aggregate data.

3. The use of simple or multiple regression equations.

4. The form of the function, or mathematical equation, used to describe the relationship between the variables.

5. The historical time period used as a base for the projections.

The importance of these factors is illustrated in figure 3 (see also app. B, table 1) which shows the results from a series of regression equations tested for use in making longrun projections of demand for newsprint.[19] The projected values in 1985 shown in figure 3 range from 9.7 million tons to 15.7 million tons. The coefficients or indexes of determination and the standard errors of estimate in the equations were all in the range usually accepted by research workers in making projections (app. B, table 1). The differences in the projected values are due to the factors listed above.

[18] Ezekiel and Fox, op. cit., pp. 101–102, and Waugh, Frederick V. *Graphic analysis in agricultural economics.* U.S. Dept. Agr. Handb. 128. 1957.

[19] The projections of population and economic activity shown in appendix B, table 4, were used as the independent variables in making the projections of demand for paper and board shown in tables 1–7 and figures 3, 6–9, and 11–13. Thus, none of the differences in the projected demands for newsprint in figure 3, and in the other grades used as examples and shown in these tables and figures, is attributable to the use of different values for the independent variables. The effects of using different projected values of the independent variables—population and economic activity—are discussed on pages 42 and 43.

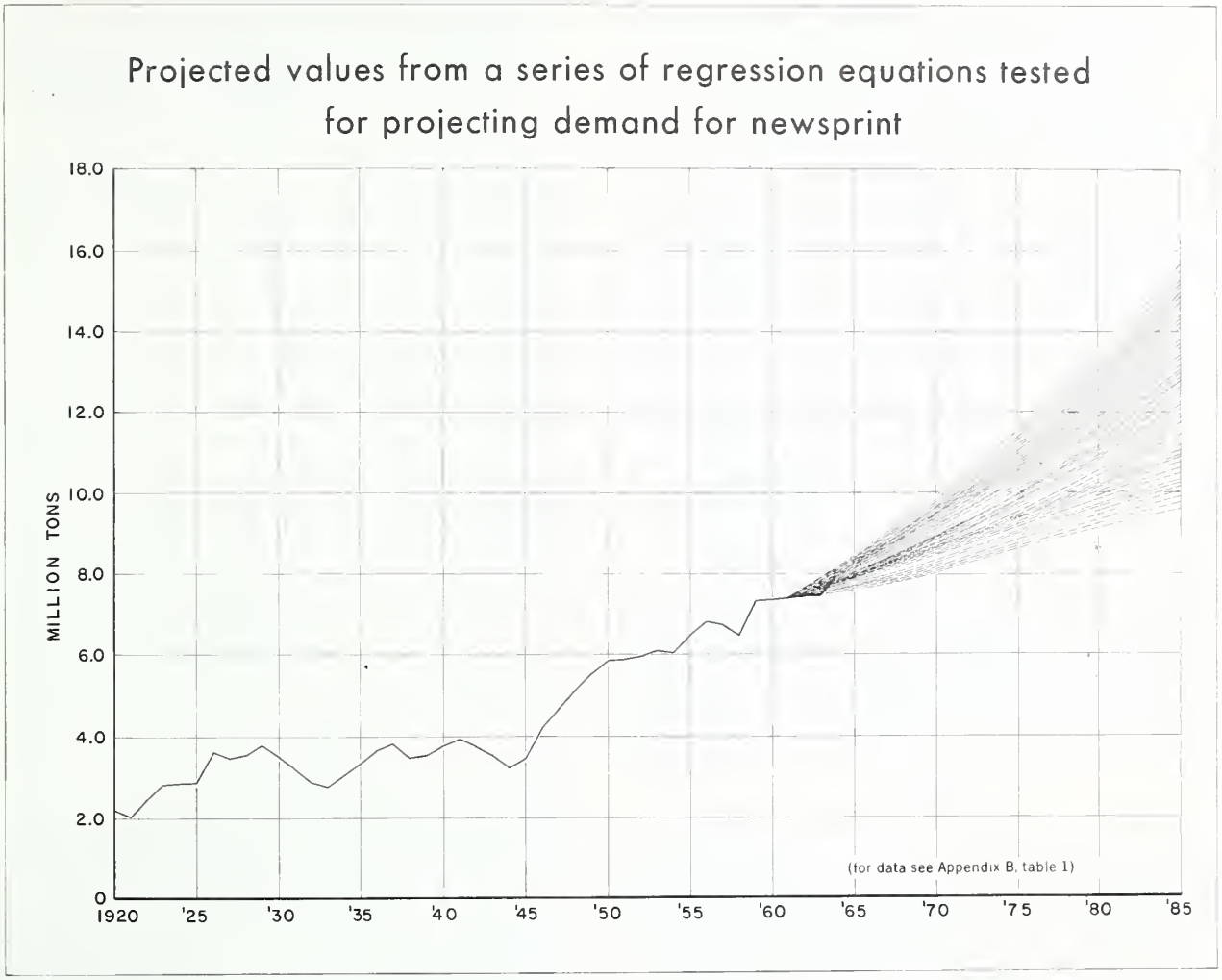


FIGURE 3.

### *Traditionally three basic criteria have been used in choosing independent variables for projecting longrun trends*

The independent variable is a major determinant of the projected values for a dependent variable. Traditionally, three criteria have been used in choosing independent variables for projecting longrun trends in demand for products such as the major grades of paper and board. These are:

1. The availability of longrun estimates or projections of future values of the independent variables.

2. The closeness of the historical functional relationships between the independent and dependent variables.

3. The casuality of the relationship between the independent and dependent variables.

Longrun projections of potentially usable independent variables for projecting demand for paper and board such as population, households, gross national product, disposable personal income, industrial production, construction expenditures, residential construction, and prices are prepared and published at more or less regular intervals by several responsible public and private agencies.[20] All of such potentially usable independent variables were tested for use in projecting demand for the major grades of paper and board. As a first step, scatter diagrams were plotted to determine if there were functional relationships between each of the independent variables for which projections of future values are likely to be available and each major grade of paper and board (app. A). In all cases where the plotting indicated that a functional relationship existed, regression equations were fitted to the data (app. B). The results of the graphical

[20] See footnote p. 8.

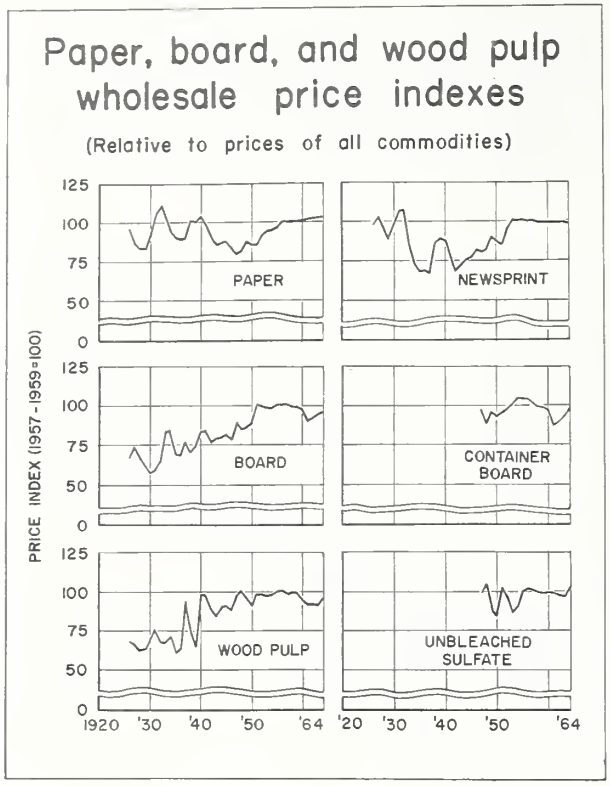


FIGURE 4.

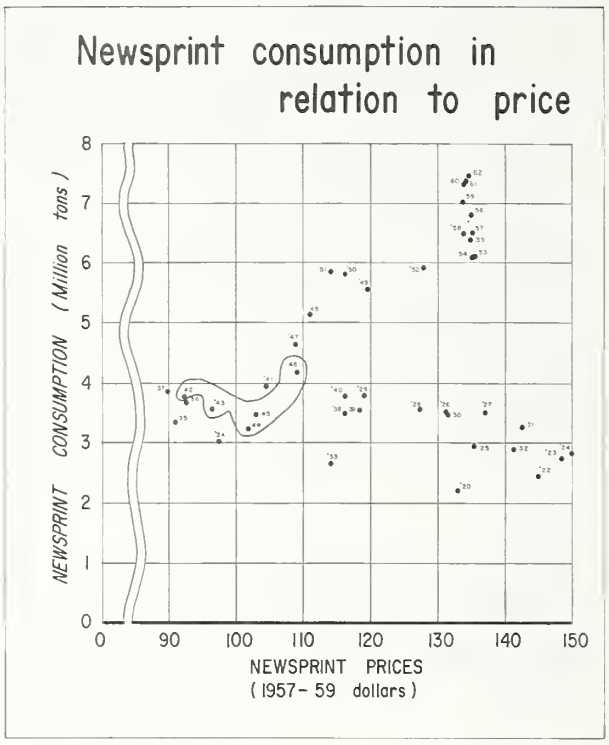


FIGURE 5.

and statistical tests indicated that there were close functional relationships between consumption of most grades of paper and board and most of the independent variables such as population, gross national product, and disposable personal income for which projections of future values are likely to be available.

There was one notable exception—price. The price of a product has always been considered an important determinant of consumption—with consumption tending to vary inversely to price changes. However, and especially in recent years when there have been large increases in use, prices of most grades of paper and board (also wood pulp and pulpwood) have not shown much change in relation to the general price level (fig 4; app. C, tables 1–4). As a result, the graphical and statistical tests showed no functional relationship between prices and consumption (both per capita and total) of the various grades of paper and board (for example, see fig. 5). Presumably there was a hidden causal relationship, with the stability in relative prices being a contributing factor to the rapid increases in consumption shown by most grades of paper and board.

[20] Recent major studies which have included longrun projections of population and/or gross national product, and other related measures of economic activity are:
U.S. Department of Commerce, Bureau of the Census. *Projections of the population of the United States, by age, sex, and color to 1990, with extensions of total population to 2015.* Population estimates. Cur. Pop. Rpt. Ser. P–25, 359. 1967. *Revised projections of the population of the United States by age and sex to 1985.* Ibid., 329. 1966. *Projections of the population of the United States by age and sex: 1964 to 1985 with extensions to 2010.* Ibid., 286. 1964. *Interim revised projections of the number of households and families: 1965 to 1980.* Population characteristics. Cur. Pop. Rpt. Ser. P–20, 123. 1963.
Missouri Basin Inter-Agency Committee, Standing Committee on Comprehensive Basin Planning. *The Missouri River Basin, comprehensive framework study: preliminary economic projections for the Missouri River Basin.* Kansas City, Mo.: Missouri Basin Comprehensive Plan Economic Work Group. 1965.
U.S. Department of Agriculture, Forest Service. *Timber trends in the United States.*
U.S. Congress, House Committee on Interstate and Foreign Commerce, op. cit.
Outdoor Recreation Resources Review Commission Staff, National Planning Association, and U.S. Department of Labor, Bureau of Labor Statistics. *Projections to the years 1976 and 2000: economic growth, population, labor force, leisure, and transportation.* ORRRC Study Rpt. 23. Washington: U.S. Government Printing Office. 1962.
Resources for the Future, Inc., op. cit.
U.S. Congress, Senate Select Committee on National Water Resources. *Population projections and economic assumptions.* Water resources activities in the United States. Committee Print 5, 86th Cong., 2d sess. 1960.

### *Tests showed close functional relationships between several independent variables and consumption of paper and board—relationships also appeared to be causal*

Although the graphical and statistical tests indicated that there was a close functional relationship between changes in most of the independent variables and changes in consumption of most of the major grades of paper and board, there is no statistical way to establish that these relationships were causal, i.e., that the changes in the independent variables caused the changes in the dependent variables. Yet this is a matter of great importance in making projections which extend beyond the range of the base data. The validity of such projections rests in part upon the assumption that the relationships in the base period will continue through the projection period. The chances that this will occur are greater if changes in the dependent variable are caused by, rather than merely associated with, changes in the independent variable.

While it cannot be mathematically established that the historical relationships were causal, it seems logical to conclude that the relationships between changes in such independent variables as population and income and changes in the consumption of the major grades of paper and board were both functional and causal. Admittedly, in many relationships the cause and effect were indirect. The volume of newsprint consumption, for example, is directly a function of such factors as number of newspapers, circulation, frequency of publication, number of pages, and page size. Somewhat more indirectly, consumption can be considered as a function of such things as the demand for advertising and news space; prices of newsprint and advertising space; and income of subscribers, advertisers, and other customers.[21] However, longrun projections of these and the more direct determinants are usually not available and thus they are not readily adaptable for use as independent variables.

Changes in the direct determinants are, of course, a function of changes in the aggregate variables such as population and gross national product, and the effects of the direct variables on demand are thus implicitly included in any model using these aggregates as the independent variables. Also most of the overall measures of economic activity used as independent variables, such as the gross national product, implicitly include the effects of many factors or influences such as the level of literacy, consumer tastes, and technological developments which cannot be readily quantified and/or explicitly recognized in a regression equation.

### *Several independent variables meet traditional criteria—but the projected values of the dependent variables are substantially different*

On the basis of the three criteria that have traditionally been applied in choosing independent variables (see page 7), it appears that several independent variables could be used in projecting demands for most of the major grades of paper and board. The various possibilities for container board [22]—the most important grade of paper and board in terms of volume consumed—are as follows:

Population
Households
Gross national product
Disposable personal income
Industrial production

Although these independent variables meet the traditional criteria, the projected values obtained from their use are substantially different, especially by 1985. These differences are illustrated by the projections shown in table 1 and figure 6. The projections in this table and

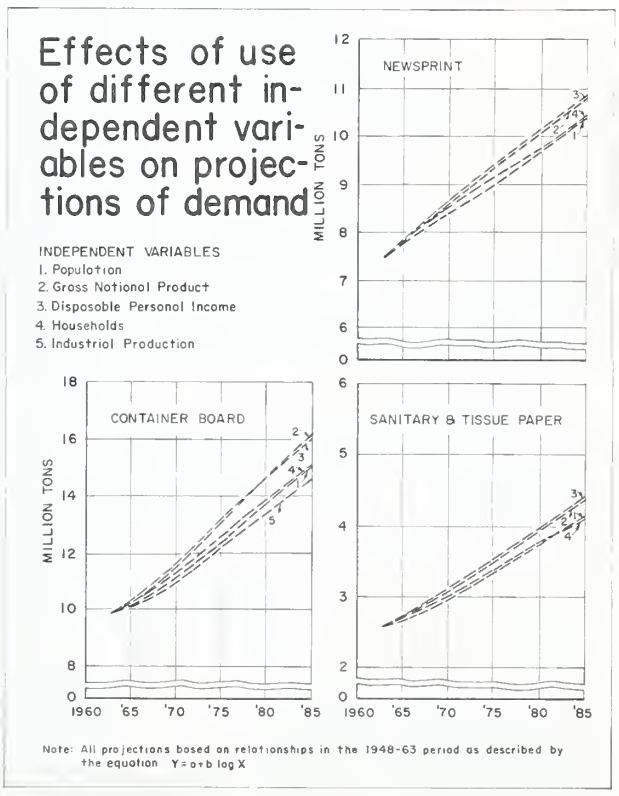


FIGURE 6.

[21] Riihinen, op. cit.

[22] Newsprint, sanitary and tissue paper, and container board have been chosen as representative grades to illustrate differences resulting from changing independent variables, functions, time periods, etc.

figure were derived by holding constant all the other factors that affect the level of a projection, i.e., the form of the equation, the historical time period used as the base for the projection, the units used in measuring the variables, and the form of equation (see list on page 6).

Part of the differences in the projections may be due to chance or random variation in the independent variables.[23] As indicated below (see page 19) the level of a projection, particularly one extending as far in the future as 1985, is very sensitive to the values of the observations at the beginning and ending of the time period used as the base. Thus, any chance variation in the values of one of the independent variables in these critical periods that was much above or below trend could alter the slope of the regression line and materially affect the level of a projection. However, there was no evidence that chance variation was the cause of the differences shown in table 1 as projections obtained from a series of tests, using different time periods (see data in tables 1, 2, and 3 in app. B), showed about the same ranking and amount of variation as those in table 1.

If chance is eliminated as a cause of the differences in the projections, the choice of the independent variable becomes an important consideration in making longrun projections. The standard statistical measures provided no basis for choosing among the several independent variables that could be used for projecting demands for container board or any of the other major grades of paper or board (see data in the tables in app. B). The relationships were causal, the standard errors of estimate were in the range usually accepted in making projections, and nearly all of the variation in the dependent variables in the base period was associated with changes in the independent variables—more than 94 percent of the total in the case of container board.

### Trends in per capita use give best indication as to which independent variables to use

Although the standard statistical measure provided no grounds for choosing among independent variables, trends in per capita use provide a logical basis for making a choice. For those grades of paper and board where there has been little or no increase in per capita consumption in the time period used as a base for the projection, future changes in total use can

TABLE 1.—*Effects of use of different independent variables on projections of demand for selected grades of paper and board (All projections derived from the use of the equation* $Y = a + b \log X$ *fitted to data in the period 1948–63)*

| Variable | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Newsprint:* | | | | | | | | | | |
| Newsprint consumption as a function of: | | | | | | | | | | |
| Population | 7,557 | 79.80 | 8,387 | 80.64 | 8,994 | 80.66 | 9,671 | 80.26 | 10,333 | 79.48 |
| Gross national product | 7,557 | 79.80 | 8,559 | 82.30 | 9,306 | 83.46 | 10,036 | 83.29 | 10,797 | 83.05 |
| Disposable personal income | 7,557 | 79.80 | 8,637 | 83.05 | 9,362 | 83.96 | 10,047 | 83.38 | 10,803 | 83.10 |
| Households | 7,557 | 79.80 | 8,505 | 81.78 | 9,100 | 81.61 | 9,759 | 80.99 | 10,366 | 79.74 |
| *Sanitary and tissue paper:* | | | | | | | | | | |
| Sanitary and tissue paper consumption as a function of: | | | | | | | | | | |
| Population | 2,566 | 27.10 | 2,951 | 28.38 | 3,320 | 29.78 | 3,732 | 30.97 | 4,135 | 31.81 |
| Gross national product | 2,566 | 27.10 | 3,037 | 29.20 | 3,485 | 31.26 | 3,923 | 32.56 | 4,380 | 33.69 |
| Disposable personal income | 2,566 | 27.10 | 3,095 | 29.76 | 3,534 | 31.70 | 3,950 | 32.78 | 4,407 | 33.90 |
| Households | 2,566 | 27.10 | 3,006 | 28.90 | 3,364 | 30.17 | 3,760 | 31.20 | 4,125 | 31.73 |
| *Container board:* | | | | | | | | | | |
| Container board consumption as a function of: | | | | | | | | | | |
| Population | 9,846 | 103.97 | 11,073 | 106.47 | 12,328 | 110.56 | 13,726 | 113.91 | 15,093 | 116.10 |
| Gross national product | 9,846 | 103.97 | 11,472 | 110.31 | 13,032 | 116.88 | 14,556 | 120.80 | 16,145 | 124.19 |
| Disposable personal income | 9,846 | 103.97 | 11,604 | 111.58 | 13,107 | 117.55 | 14,529 | 120.57 | 16,096 | 123.82 |
| Industrial production | 9,846 | 103.97 | 10,923 | 105.03 | 12,135 | 108.83 | 13,379 | 111.03 | 14,619 | 112.45 |
| Households | 9,846 | 103.97 | 11,290 | 108.56 | 12,513 | 112.22 | 13,866 | 115.07 | 15,112 | 116.25 |

[23] Chance variation in the dependent variable would tend to affect the results obtained from the different independent variables in much the same way and would not be a cause of differences in the projections.

logically be expected to be a function of changes in population or households. For those grades where there has been a slow increase in per capita use, presumably in response to increases in the output of goods and services or income, some measure of economic activity, such as the gross national product, disposable personal income, industrial production, or construction, appears to be the best choice as an independent variable for projecting total demand.

In fact, there have been fairly rapid increases in per capita consumption of most of the major grades of paper and board. These increases have shown a high correlation with growth in per capita gross national product and per capita disposable personal income. Thus, for most grades of paper and board the choice of independent variables is further complicated as it is possible to express the values of the variables either on a per capita or aggregate basis.

This is another important choice because the projections derived from the use of equations with per capita data were usually substantially different from those obtained from equations using aggregate data (table 2; fig. 7). For example, projected demands for container board in 1985, derived from the equation $Y = a + b \log X$ with all other factors influencing the level of the projection except the

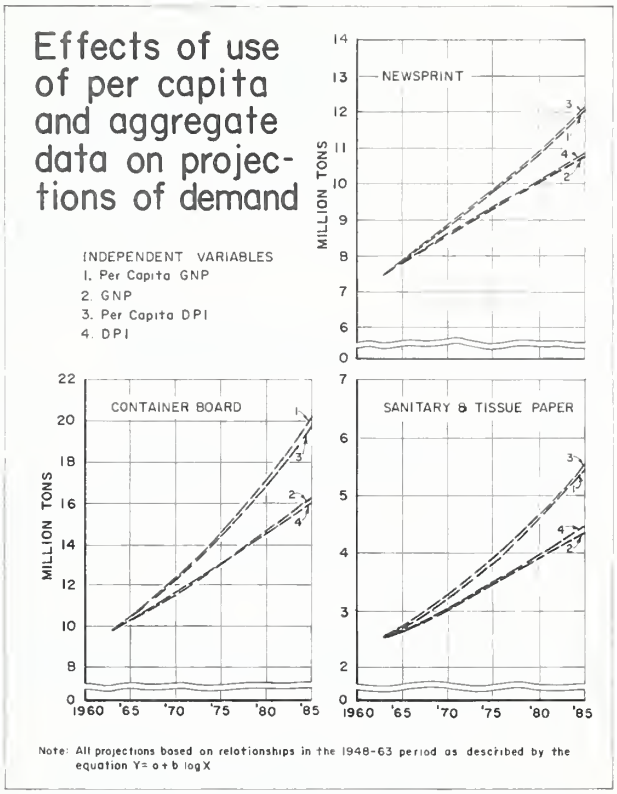


FIGURE 7.

TABLE 2.—*Effects of use of per capita and aggregate data on projections of demand for selected grades of paper and board (All projections derived from the use of the equation $Y = a + b \log X$ fitted to data in the period 1948–63)*

| Variable | Consumption 1963 | | Projected demand 1970 | | 1975 | | 1980 | | 1985 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Newsprint:* | | | | | | | | | | |
| Per capita newsprint consumption as a function of per capita gross national product | 7,557 | 79.80 | 8,788 | 84.50 | 9,746 | 87.41 | 10,852 | 90.06 | 12,076 | 92.89 |
| Newsprint consumption as a function of gross national product | 7,557 | 79.80 | 8,559 | 82.30 | 9,306 | 83.46 | 10,036 | 83.29 | 10,797 | 83.05 |
| Per capita newsprint consumption as a function of per capita disposable personal income | 7,557 | 79.80 | 8,850 | 85.10 | 9,791 | 87.81 | 10,881 | 90.30 | 12,106 | 93.12 |
| Newsprint consumption as a function of disposable personal income | 7,557 | 79.80 | 8,637 | 83.05 | 9,362 | 83.96 | 10,047 | 83.38 | 10,803 | 83.10 |
| *Sanitary and tissue paper:* | | | | | | | | | | |
| Per capita sanitary and tissue paper consumption as a function of per capita gross national product | 2,566 | 27.10 | 3,217 | 30.93 | 3,880 | 34.80 | 4,618 | 38.32 | 5,472 | 42.09 |
| Sanitary and tissue paper consumption as a function of gross national product | 2,566 | 27.10 | 3,037 | 29.20 | 3,485 | 31.26 | 3,923 | 32.56 | 4,380 | 33.69 |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | 2,566 | 27.10 | 3,282 | 31.56 | 3,919 | 35.15 | 4,632 | 38.44 | 5,482 | 42.17 |
| Sanitary and tissue paper consumption as a function of disposable personal income | 2,566 | 27.10 | 3,095 | 29.76 | 3,534 | 31.70 | 3,950 | 32.78 | 4,407 | 33.90 |

TABLE 2.—*Effects of use of per capita and aggregate data on projections of demand for selected grades of paper and board*—Continued
(*All projections derived from the use of the equation* $Y = a + b \log X$ *fitted to data in the period 1948–63*)

| Variable | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Container board:* | | | | | | | | | | |
| Per capita container board consumption as a function of per capita gross national product | 9,846 | 103.97 | 12,236 | 117.65 | 14,581 | 130.77 | 17,198 | 142.72 | 20,214 | 155.49 |
| Container board consumption as a function of gross national product | 9,846 | 103.97 | 11,472 | 110.31 | 13,032 | 116.88 | 14,556 | 120.80 | 16,145 | 124.19 |
| Per capita container board consumption as a function of per capita disposable personal income | 9,846 | 103.97 | 12,284 | 118.12 | 14,463 | 129.71 | 16,910 | 140.33 | 19,807 | 152.36 |
| Container board consumption as a function of disposable personal income | 9,846 | 103.97 | 11,604 | 111.58 | 13,107 | 117.55 | 14,529 | 120.57 | 16,096 | 123.82 |

unit of measurement held constant (see list of other factors on page 6), ranged from 16.1 million tons (aggregate data) to 20.2 million tons (per capita data).

### *Per capita data preferred for making projections where relationships have been close enough to provide a basis for projections*

The regression equations used in deriving these figures met all the tests commonly applied in determining suitability for use in making projections, and thus there was no statistical basis for choosing between per capita and aggregate data. Logically, however, it is preferable to use per capita data because the relationships between per capita consumption and per capita output or income are relatively direct and not confused by the growth in population which accounts for part of the change in aggregate consumption and output or income.[24] As a practical matter, the projections obtained when per capita data were used seemed (on a judgment basis) to be more in line with historical trends than those obtained from aggregate data, especially when equations of the general form $Y = a + b \log X$ (fig. 8) or $\log Y = a + b \log X$ were used.[25]

Although it seems fairly clear that per capita data should be used for projections where good correlations exist, there still remains, for many grades of paper and board, a choice between the use of per capita disposable personal income and per capita gross national product as the independent variables. Because these independ-

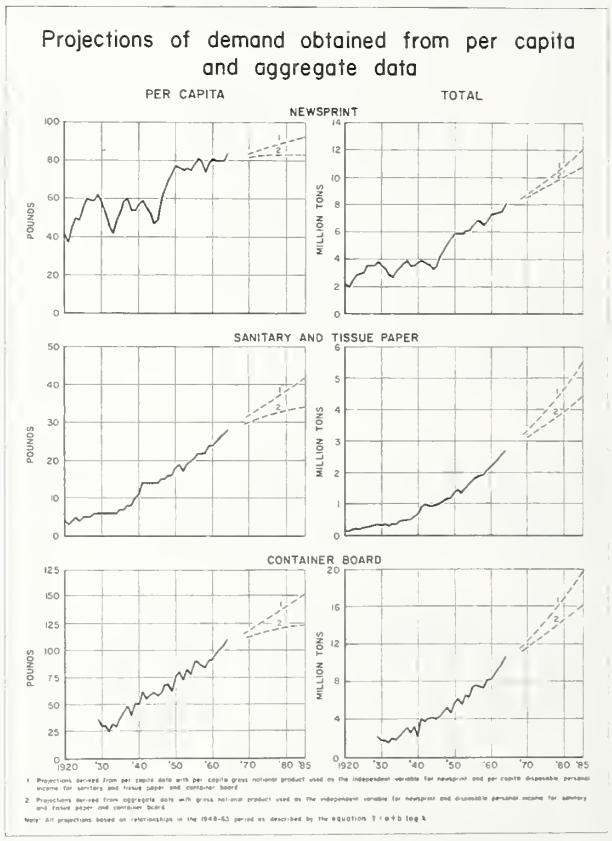


FIGURE 8.

[24] Foote, op. cit. p. 28, and others have recommended the use of per capita data wherever applicable for this reason.

[25] The tests showed that projections obtained from household data, i.e., consumption per household and output or income per household, also gave projections of demand which on a judgment basis seemed more in line with historical trends. However, since the projections of households are derived from population projections, it seemed simpler and easier to use the per capita data.

ent variables are very closely related, the projected values derived from their use are about the same, and this choice is not a matter of much practical significance.

### *The use of first differences considered but not used*

In deciding how the variables were to be measured, the use of first differences [26] was considered as an alternative to using actual aggregate or per capita data. Some statisticians recommend the use of first differences when successive unexplained residuals have a high positive correlation.[27]

However, tests of the residuals [28] for different grades of paper and board indicated a low or negative correlation, and thus first differences were not used in this analysis.

### *Simple regression equations preferred to multiple regression equations*

The preceding discussion has been concerned with choices among regression equations with a single independent variable, that is, simple regression equations. It is also possible to use equations with more than one independent variable or multiple regression equations. This alternative is another important consideration in projecting demands for paper and board since the projections obtained from the two kinds of regression equations, with all other factors affecting the level of the projection held constant (see list of other factors on page 6), usually showed fairly large differences. For example, the projections of demand for container board in 1985 ranged from about 16 million tons with a multiple regression to 20.2 million tons with a simple regression (table 3; fig. 9).

The statistical measures obtained from the tests showed that a little more of the variation in the dependent variables was explained by the multiple regressions. These tests also showed a high correlation among the independent variables such as population and per capita disposable personal income or per capita gross

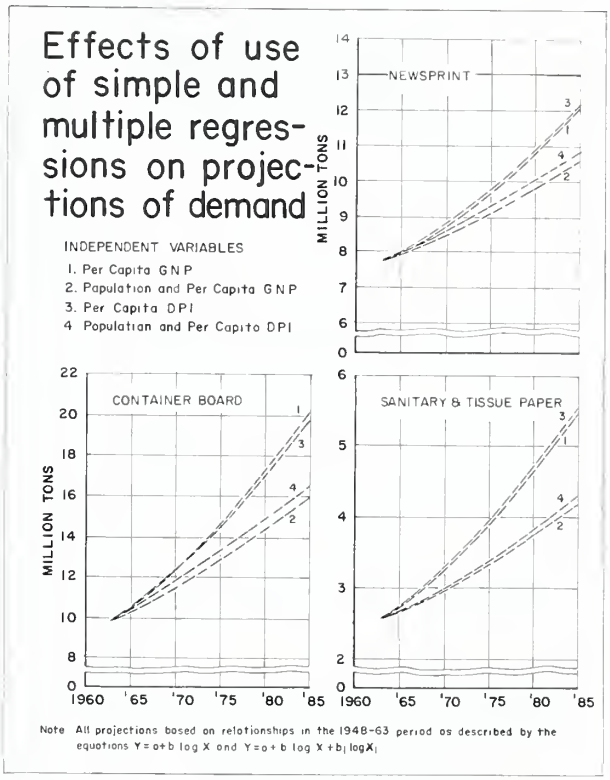


FIGURE 9.

national product available for use in multiple regressions.[29] Generally this correlation (multicollinearity) among the independent variables is considered undesirable by statisticians because it results in a distortion of the *b* coefficients in the equations. The coefficient or indexes of partial correlation are also distorted, and it is difficult to determine the net explanatory effect of changes in each of the independent variables on the changes in the dependent variable.

There is no statistical evidence that the projections obtained from multiple regressions, with highly correlated independent variables, are likely to be less reliable than those from simple regressions. However, the projected

[26] First differences measure the change in each observation from that of the preceding year. They may be expressed in terms of actual year to year changes, as percents, or as first differences of logarithms.

[27] According to Foote, op. cit., pp. 29–30, ". . . first differences should be used in preference to actual data when the successive unexplained residuals from single-equation analyses based on actual data are almost perfectly serially correlated with a positive sign . . . If the unexplained residual in one year on the average equals a fixed proportion of the unexplained residual in the preceding year plus a random variable, resulting in some degree of positive serial correlation, then a transformation to first differences may remove some of the serial correlation in the residuals. If the serial correlation is less than 0.5 or negative, a conversion to first differences tends to make the degree of serial correlation in the residuals greater in the transformed than in the original analysis and first differences should not be used."

[28] Computer printouts of the calculated values of the dependent variables and the "residuals," i.e., the difference between the actual and calculated values for all the equations tested, are on file in the Washington Office of the Forest Service.

[29] The computer printouts on file in the Washington Office of the Forest Service show the correlation coefficients between the independent variables.

TABLE 3.—*Effects of use of simple and multiple regression equations on projections of demand for selected grades of paper and board (All projections derived from the use of the equations* $Y = a + b \log X$ *and* $Y = a + b \log X + b_i \log X_i$ *fitted to data in the period 1948–63)*

| Variable | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Newsprint:* | | | | | | | | | | |
| Per capita newsprint consumption as a function of per capita gross national product | 7,557 | 79.80 | 8,788 | 84.50 | 9,746 | 87.41 | 10,852 | 90.06 | 12,076 | 92.89 |
| Newsprint consumption as a function of population and per capita gross national product | 7,557 | 79.80 | 8,490 | 81.63 | 9,158 | 82.13 | 9,874 | 81.94 | 10,585 | 81.42 |
| Per capita newsprint consumption as a function of per capita disposable personal income | 7,557 | 79.80 | 8,850 | 85.10 | 9,791 | 87.81 | 10,881 | 90.30 | 12,106 | 93.12 |
| Newsprint consumption as a function of population and per capita disposable personal income | 7,557 | 79.80 | 8,637 | 83.05 | 9,350 | 83.86 | 10,062 | 83.50 | 10,817 | 83.21 |
| *Sanitary and tissue paper:* | | | | | | | | | | |
| Per capita sanitary and tissue paper consumption as a function of per capita gross national product | 2,566 | 27.10 | 3,217 | 30.93 | 3,880 | 34.80 | 4,618 | 38.32 | 5,472 | 42.09 |
| Sanitary and tissue paper consumption as a function of population and per capita gross national product | 2,566 | 27.10 | 2,960 | 28.47 | 3,329 | 29.86 | 3,744 | 31.07 | 4,149 | 31.91 |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | 2,566 | 27.10 | 3,282 | 31.56 | 3,919 | 35.15 | 4,632 | 38.44 | 5,482 | 42.17 |
| Sanitary and tissue paper consumption as a function of population and per capita disposable personal income | 2,566 | 27.10 | 2,998 | 28.83 | 3,387 | 30.37 | 3,808 | 31.61 | 4,229 | 32.53 |
| *Container board:* | | | | | | | | | | |
| Per capita container board consumption as a function of per capita gross national product | 9,846 | 103.97 | 12,236 | 117.65 | 14,581 | 130.77 | 17,198 | 142.72 | 20,214 | 155.49 |
| Container board consumption as a function of population and per capita gross national product | 9,846 | 103.97 | 11,388 | 109.50 | 12,852 | 115.27 | 14,372 | 119.27 | 15,903 | 122.33 |
| Per capita container board consumption as a function of per capita disposable personal income | 9,846 | 103.97 | 12,284 | 118.12 | 14,463 | 129.71 | 16,910 | 140.33 | 19,807 | 152.36 |
| Container board consumption as a function of population and per capita disposable personal income | 9,846 | 103.97 | 11,798 | 113.45 | 13,366 | 119.87 | 14,853 | 123.26 | 16,493 | 126.87 |

values, particularly the per capita values, obtained from most of the multiple regressions tested, are below the levels which an extrapolation of historical trends would indicate as being reasonable. In view of this, the distortions in the *b* coefficients, and the small net explanatory effect of the additional variable simple regressions appear to be the best choice for projecting demands for the major grades of paper and board.

### *The determination of the form of the functional relationships between economic variables is a major problem in regression analysis*

A regression equation is a means of mathematically measuring a relationship between variables. The relationships between most economic variables are complex and not very exact, and the determination of an equation

which best describes the form of the relationship is a major problem in regression analysis.

If traced over a long enough period of time, relationships between consumption of most grades of paper and board and income have shown a typical pattern. Starting from a low level, the dependent variable first tends to rise very rapidly in relation to the independent variable, then gradually slows as the change associated with another increment in the independent variable becomes progressively smaller. This kind of a functional relationship is illustrated by the curve in figure 10. This curve or function also approximates the general concept of a production function and the growth curve followed by many plants and animals.

The mathematical equation for the curve in figure 10 is complex. However, it can be broken into three segments whose general forms can be described by the simple equations log $Y = a + b \log X$, $Y = a + b X$, and $Y = a + b \log X$.

### *Statistical tests indicate three different equations describe historical relationships about equally well but levels of projections show wide differences*

In this study all three equations were tested to see which best described the historical relationships between consumption of each of the major grades of paper and board and all of the independent variables where graphical analysis indicated a reasonably close relationship existed. It was expected that there would be significant differences in the fit of the equations to the data and that it would be possible to determine mathematically which best described (as measured by the coefficients or indexes of determination and the standard errors of estimate) the historical relationships. However, all three equations seemed to describe the historical relationships between consumption of the major grades of paper and board and the independent variables about equally well. The differences in the coefficients or indexes of determination and in the standard errors of estimate among the equations tested were small (see app. B), and there was no statistical basis for selecting one of the equations as the best for making projections.

Despite the apparent lack of differences in the fit of the three equations to the historical series, the projections obtained (with all other factors affecting the level of projection held constant) were widely different (table 4; fig. 11). In most of the equations tested the highest projections were derived from the equation log $Y = a + b \log X$, intermediate projections from $Y = a + b X$, and the lowest projections

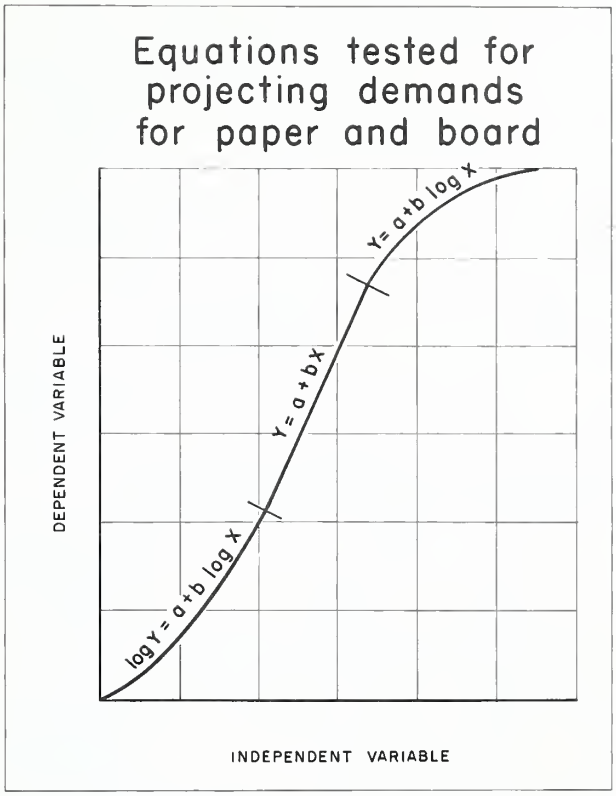


FIGURE 10.

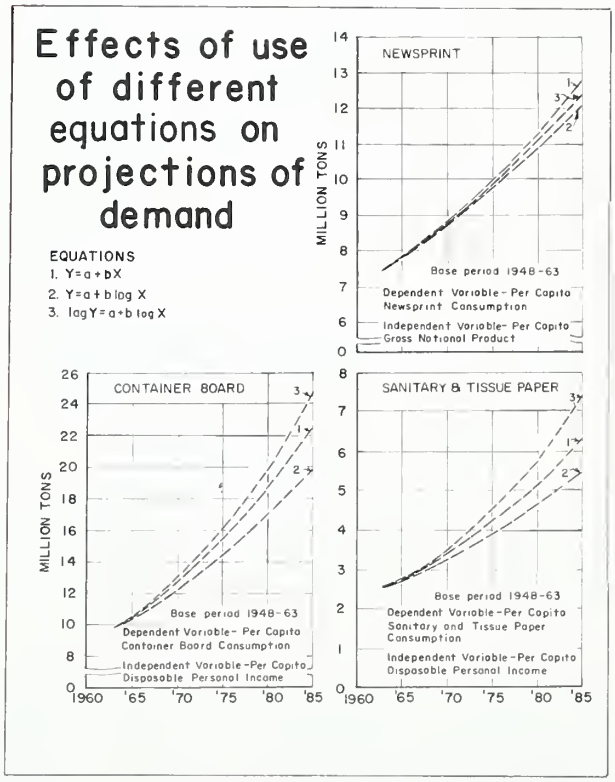


FIGURE 11.

TABLE 4.—*Effects of use of different regression equations on projections of demand for selected grades of paper and board (All projections based on the relationships in the 1948–63 period)*

| Variable and regression equation | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Newsprint:* | | | | | | | | | | |
| Per capita newsprint consumption as a function of per capita gross national product | | | | | | | | | | |
| $Y = a + b X$ | 7,557 | 79.80 | 8,891 | 85.49 | 9,977 | 89.48 | 11,263 | 93.47 | 12,760 | 98.15 |
| $Y = a + b \log X$ | 7,557 | 79.80 | 8,788 | 84.50 | 9,746 | 87.41 | 10,852 | 90.06 | 12,076 | 92.89 |
| $\log Y = a + b \log X$ | 7,557 | 79.80 | 8,834 | 84.94 | 9,840 | 88.25 | 11,012 | 91.39 | 12,329 | 94.84 |
| *Sanitary and tissue paper:* | | | | | | | | | | |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | | | | | | | | | | |
| $Y = a + b X$ | 2,566 | 27.10 | 3,415 | 32.84 | 4,208 | 37.74 | 5,138 | 42.64 | 6,332 | 48.71 |
| $Y = a + b \log X$ | 2,566 | 27.10 | 3,282 | 31.56 | 3,919 | 35.15 | 4,632 | 38.44 | 5,482 | 42.17 |
| $\log Y = a + b \log X$ | 2,566 | 27.10 | 3,477 | 33.43 | 4,563 | 40.92 | 5,774 | 47.92 | 7,452 | 57.32 |
| *Container board:* | | | | | | | | | | |
| Per capita container board consumption as a function of per capita disposable personal income | | | | | | | | | | |
| $Y = a + b X$ | 9,846 | 103.97 | 12,735 | 122.45 | 15,416 | 138.26 | 18,564 | 154.06 | 22,573 | 173.64 |
| $Y = a + b \log X$ | 9,846 | 103.97 | 12,284 | 118.12 | 14,463 | 129.71 | 16,910 | 140.33 | 19,807 | 152.36 |
| $\log Y = a + b \log X$ | 9,846 | 103.97 | 13,078 | 125.75 | 16,134 | 144.70 | 19,828 | 164.55 | 24,747 | 190.36 |

from $Y = a + b \log X$ (see app. B). For example, the projected demand for container board in 1985 obtained from projecting the relationship between per capita consumption and per capita disposable income in the 1948–63 period ranged from a low of 19.8 million tons ($Y = a + b \log X$), to an intermediate level of 22.6 million tons ($Y = a + b X$). and a high of 24.7 million tons ($\log Y = a + b \log X$).

### *Substantive and theoretical considerations indicate that an equation of the general form Y = a + b log X is the best choice for projecting longrun demands for most grades of paper and board*

Although the standard statistical measures, such as coefficients or indexes of determination and errors of estimate, provided no basis for choosing among equations, there were other grounds for making a choice. First a visual examination of the plotted relationships between most grades of paper and board and the independent variables that seemed suitable for projecting demands indicated that most of the historical relationships were of the general form described by the equation $Y = a + b \log X$ (see graphs in app. A).

Second was the pattern of the projection. For most grades of paper and board and most test relationships, the projections obtained from the equation $\log Y = a + b \log X$ fitted to the data in postwar years (years after 1946) were substantially below those obtained from the same equation fitted to data that also included the prewar years (years 1920–42 for which data are available) (app. B). The projections obtained from the equation $Y = a + b X$ fitted to the postwar data were also generally below those obtained when the prewar data were included. On the other hand, the projections derived from the equation $Y = a + b \log X$ fitted to the postwar data were frequently close to or above those obtained when the earlier years were included. This kind of pattern in the projections means that the slope of the lines describing the actual relationships has flattened out and suggests that the relationships for most grades of paper and board have been approaching the general form of the equation $Y = a + b \log X$.

Third, the residuals—the differences between actual consumption of a grade of paper or board and the calculated consumption derived from the equations $Y = a + b X$ and $\log Y = a + b \log X$—tended to be grouped for most grades of paper and board, with actual consumption being above calculated consumption

in the middle of the series of data and below the calculated values near the extremes. In contrast, the distribution of the residuals around the equation $Y = a + b \log X$ tended to be randomely distributed—a further indication that this equation best described the historical relationships for most grades of paper and board.

The above evidence on the general form of the equations describing the historical relationships between changes in consumption of paper and board and independent variables such as income is in agreement with the theory of diminishing marginal utility. This theory indicates that as an individual's income rises beyond some threshold value (the point of change from equation $\log Y = a + b \log X$ to equation $Y = a + b X$ in figure 10) a progressively smaller portion of each increment will be spent on any given good. Thus, beyond the threshold value, the income elasticity of demand [30] for a given grade of paper or board declines as income rises, and the form of the function describing the relationship gradually flattens out until the change in per capita consumption associated with an increment of per capita income becomes infinitesimal—a characteristic of the equation $Y = a + b \log X$.

Some evidence of a decline in the income elasticity of demand is provided by the following data which show the average per capita income elasticity of consumption [31] of newsprint for various periods between 1920 and 1963.

| *Time period* | *Per capita income elasticity of consumption* [31] |
|---|---|
| 1920–35 | 1.09 |
| 1925–40 | 0.74 |
| 1930–40 and 1948–53 | .66 |
| 1935–40 and 1948–58 | .62 |
| 1947–61 | .61 |
| 1947–62 | .58 |
| 1947–63 | .53 |
| 1948–61 | .44 |
| 1948–62 | .43 |
| 1948–63 | .39 |
| 1949–61 | .35 |
| 1949–62 | .35 |
| 1949–63 | .31 |

The logic behind the theory of diminishing marginal utility of a good used directly by consumers can be applied in other ways, such as the use of building board per unit of construction, or the use of container board per unit of goods packaged. For example, building board is adaptable for only a few uses in residential construction, such as sheathing and subflooring, and once these uses are taken over per unit use levels off, both as an average for all units built and in individual units. There are also limits on the amount of container board that can be used per unit of goods packaged.

Of course this reasoning, which indicates that per capita or per unit use must in the longrun approach a saturation value, does not necessarily apply to total or aggregate use. As long as there is no actual decline in per capita or per unit use, total consumption of the various grades of paper and board will rise if there are increases in the magnitude of the independent variables, such as the gross national product or construction.

In summary, it seems fairly clear that the historical relationship between consumption of most grades of paper and board and the independent variables tested has approximated the general form of the equation $Y = a + b \log X$. There are, however, some important exceptions. Consumption of several grades of paper and board, such as sanitary and tissue paper and container board, has been rising rapidly and the analysis of the graphs showing historical relationships, the levels of the projections obtained from the two base time periods, and the distribution of residuals around the lines of the three equations indicated that the linear equation $Y = a + b X$ best described the general form of the historical relationships. Because of such exceptions it is necessary in choosing a projection equation to look carefully at all the factors which give some indication of the historical form of the relationship and make some judgment about the probable effects of diminishing marginal utility on the form of the relationship in the future.

The equation $\log Y = a + b \log X$, in which the income elasticity of demand is constant, did not appear to be a desirable choice for projecting longrun demands for any grade of paper or board. However, it should be noted that in the period following the introduction of specific grades of paper or board, as new markets are being taken over and new uses developed, this equation may be the best to use, especially for making fairly shortrun projections.

### *The postwar period is the best choice as a base time period for projections*

As some of the above discussion has indicated, one of the important determinants of the level of a projection is the time period or years used as a base in fitting the equation. Two base

[30] The income elasticity of demand is defined as the percentage change in quantity demanded resulting from a 1 percent change in income when other factors such as prices are held constant.

[31] The percentage change in per capita consumption associated with a 1 percent change in per capita income. These estimates are $b$ coefficients obtained by fitting the equation $\log Y = a + b \log X$ to data showing per capita newsprint consumption and per capita gross national product in the indicated periods. The $b$ coefficient obtained from fitting this equation to cross-sectional consumption and income data is a direct measure of the average income elasticity of demand over the specified range of income.

time periods were tested in this study—(1) a period which included years 1920–61, exclusive of World War II years 1942–46, for which data were available, and (2) the postwar years, i.e., 1947–61 in most tests. The rather substantial differences in the projections obtained from fitting the same equation ($Y = a + b \log X$) to the data in these two base periods, while holding all other factors which affect the level of the projection constant, are shown in table 5 and figure 12. For container board the 1985 projections ranged from 16.9 million tons to 19.5 million tons, a difference of 2.6 million tons.

An analysis of the statistical measures obtained in the tests of the two base periods (appendix B) indicated that in nearly all cases the *a* and *b* coefficients obtained from equations fitted to the postwar period were significantly different from those obtained when the prewar years were included. This reflects a structural change in the relationships—presumably that associated with diminishing marginal utility. When there is evidence of such structural changes the latest period, in this case the postwar period, is the better choice as a time base for projections.[32]

[32] The 1948–66 period was also tested as a base time period (see fig. 12). Most of the difference between the projections obtained from this base period and the 1948–61 period apparently reflect the unusually rapid rate of growth in consumption in the 1963–66 years (see following discussion on sensitivity).

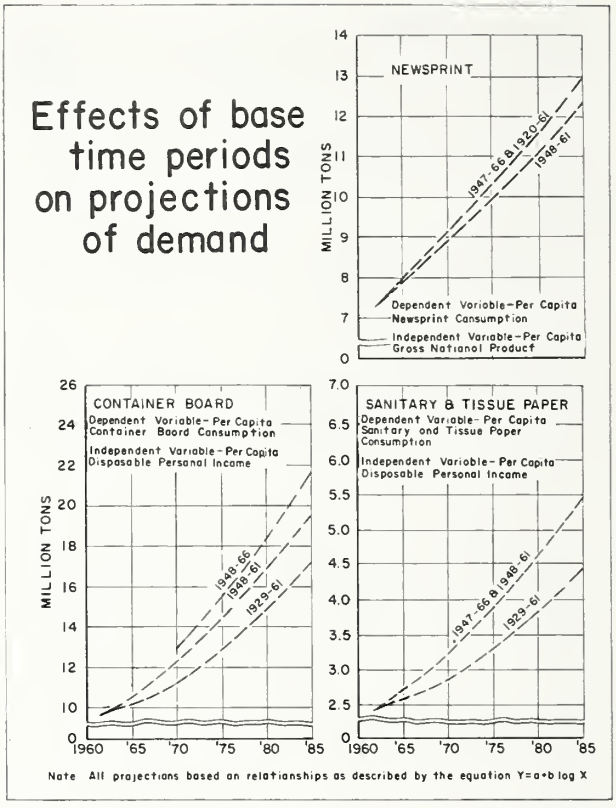


FIGURE 12.

TABLE 5.—*Effects of base time periods on projections of demand for selected grades of paper and board*
(*All projections derived from the use of the equation* $Y = a + b \log X$)

| Variable and time period | Consumption 1963 | | Projected demand 1970 | | 1975 | | 1980 | | 1985 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Newsprint:* | | | | | | | | | | |
| Per capita newsprint consumption as a function of per capita gross national product | | | | | | | | | | |
| 1920–61 | 7,557 | 79.80 | 9,128 | 87.77 | 10,252 | 91.95 | 11,539 | 95.76 | 12,978 | 99.83 |
| 1948–61 | 7,557 | 79.80 | 8,902 | 85.60 | 9,910 | 88.88 | 11,069 | 91.86 | 12,357 | 95.05 |
| *Sanitary and tissue paper:* | | | | | | | | | | |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | | | | | | | | | | |
| 1929–61 | 2,566 | 27.10 | 2,844 | 27.35 | 3,312 | 29.70 | 3,837 | 31.84 | 4,456 | 34.28 |
| 1948–61 | 2,566 | 27.10 | 3,279 | 31.53 | 3,916 | 35.12 | 4,628 | 38.41 | 5,477 | 42.13 |
| *Container board:* | | | | | | | | | | |
| Per capita container board consumption as a function of per capita disposable personal income | | | | | | | | | | |
| 1929–61 | 9,846 | 103.97 | 11,076 | 106.50 | 12,772 | 114.55 | 14,691 | 121.92 | 16,936 | 130.28 |
| 1948–61 | 9,846 | 103.97 | 12,171 | 117.03 | 14,308 | 128.32 | 16,709 | 138.66 | 19,548 | 150.37 |

### *Projections are especially sensitive to the values of the observations at beginning and ending of projection period*

In addition to the tests of base time periods, a series of tests were run to determine the effects of including or excluding years at the beginning and ending of the postwar period.[33] All tests, including those in which beginning and ending values of the dependent variables were changed from the actual values, indicated that any substantial deviation of observations near the beginning or ending of the base period from the trend level of consumption (as defined by the regression line) had an important effect on the projection.[34] For example, the projected demand in 1985 for newsprint obtained from fitting the function $Y = a + b \log X$ to per capita data in the period 1947–63 was 12.7 million tons—nearly a million tons above the projection obtained from using 1949–63 as the base period (table 6, fig. 13). The $a$ and $b$ coefficients were also significantly different.

Newsprint was in short supply in 1947 and consumption was thus abnormally low. As a result, the slope of the regression line describing the relationship between the series which included this low observation was steeper than it otherwise would have been and the level of the projection was higher. Where such abnormal or special conditions prevail, the gen-

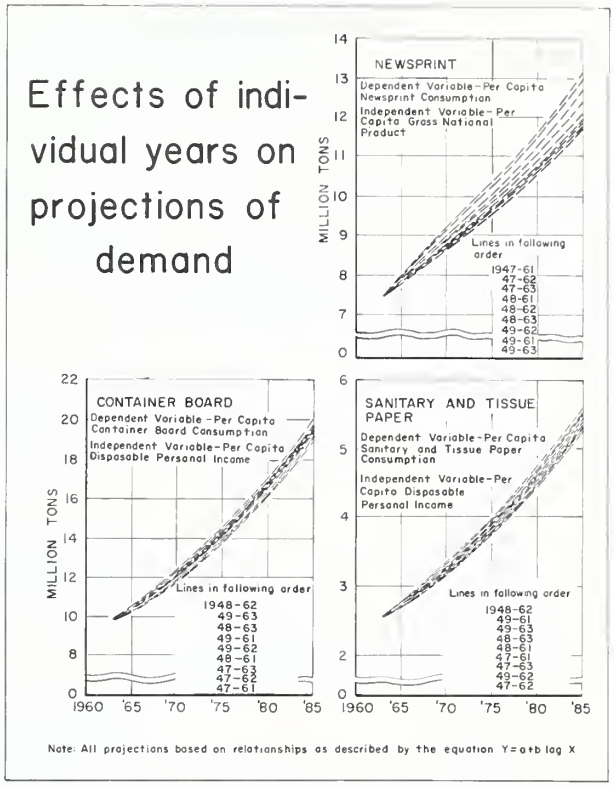


FIGURE 13.

TABLE 6.—*Effects of individual years on projections of demand for selected grades of paper and board*
(*All projections derived from the use of the equation* $Y = a + b \log X$)

| Variable and time period | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Newsprint:* | | | | | | | | | | |
| Per capita newsprint consumption as a function of per capita gross national product | | | | | | | | | | |
| 1947–61 | 7,557 | 79.80 | 9,192 | 88.38 | 10,342 | 92.75 | 11,656 | 96.73 | 13,127 | 100.98 |
| 1948–61 | 7,557 | 79.80 | 8,902 | 85.60 | 9,910 | 88.88 | 11,069 | 91.86 | 12,357 | 95.05 |
| 1949–61 | 7,557 | 79.80 | 8,746 | 84.10 | 9,669 | 86.72 | 10,738 | 89.11 | 11,916 | 91.66 |
| 1947–62 | 7,557 | 79.80 | 9,108 | 87.58 | 10,230 | 91.75 | 11,513 | 95.54 | 12,948 | 99.60 |
| 1948–62 | 7,557 | 79.80 | 8,885 | 85.43 | 9,884 | 88.65 | 11,035 | 91.58 | 12,312 | 94.71 |
| 1949–62 | 7,557 | 79.80 | 8,747 | 84.11 | 9,672 | 86.74 | 10,740 | 89.13 | 11,920 | 91.69 |
| 1947–63 | 7,557 | 79.80 | 8,988 | 86.42 | 10,060 | 90.22 | 11,288 | 93.68 | 12,659 | 97.38 |
| 1948–63 | 7,557 | 79.80 | 8,788 | 84.50 | 9,746 | 87.41 | 10,852 | 90.06 | 12,076 | 92.89 |
| 1949–63 | 7,557 | 79.80 | 8,664 | 83.31 | 9,550 | 85.65 | 10,579 | 87.79 | 11,709 | 90.07 |

[33] These tests were supplemented by a series of tests in which the values of the dependent variables at the beginning and ending of the base period were deliberately changed from the actual values. This permitted a more definitive test of the effects of deviations in the values of the dependent variable on the projections.

[34] The effects of deviation in the observations near the middle of the base period had relatively little effect on the slope of the regression line or the level of the projections.

TABLE 6.—*Effects of individual years on projections of demand for selected grades of paper and board*—Continued
(*All projections derived from the use of the equation* $Y = a + b \log X$)

| Variable and time period | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Sanitary and tissue paper:* | | | | | | | | | | |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | | | | | | | | | | |
| 1947–61 | 2,566 | 27.10 | 3,270 | 31.44 | 3,901 | 34.99 | 4,608 | 38.24 | 5,451 | 41.93 |
| 1948–61 | 2,566 | 27.10 | 3,279 | 31.53 | 3,916 | 35.12 | 4,628 | 38.41 | 5,477 | 42.13 |
| 1949–61 | 2,566 | 27.10 | 3,295 | 31.68 | 3,938 | 35.32 | 4,657 | 38.65 | 5,516 | 42.43 |
| 1947–62 | 2,566 | 27.10 | 3,221 | 30.97 | 3,833 | 34.38 | 4,520 | 37.51 | 5,336 | 41.05 |
| 1948–62 | 2,566 | 27.10 | 3,326 | 31.98 | 3,979 | 35.69 | 4,709 | 39.08 | 5,581 | 42.93 |
| 1949–62 | 2,566 | 27.10 | 3,240 | 31.15 | 3,862 | 34.64 | 4,559 | 37.83 | 5,387 | 41.44 |
| 1947–63 | 2,566 | 27.10 | 3,268 | 31.42 | 3,897 | 34.95 | 4,601 | 38.18 | 5,440 | 41.85 |
| 1948–63 | 2,566 | 27.10 | 3,282 | 31.56 | 3,919 | 35.15 | 4,632 | 38.44 | 5,482 | 42.17 |
| 1949–63 | 2,566 | 27.10 | 3,292 | 31.65 | 3,934 | 35.28 | 4,651 | 38.60 | 5,507 | 42.36 |
| *Container board:* | | | | | | | | | | |
| Per capita container board consumption as a function of per capita disposable personal income | | | | | | | | | | |
| 1947–61 | 9,846 | 103.97 | 11,993 | 115.32 | 14,049 | 126.00 | 16,361 | 135.78 | 19,092 | 146.86 |
| 1948–61 | 9,846 | 103.97 | 12,171 | 117.03 | 14,308 | 128.32 | 16,709 | 138.66 | 19,548 | 150.37 |
| 1949–61 | 9,846 | 103.97 | 12,267 | 117.95 | 14,448 | 129.58 | 16,898 | 140.23 | 19,800 | 152.31 |
| 1947–62 | 9,846 | 103.97 | 12,007 | 115.45 | 14,065 | 126.14 | 16,380 | 135.93 | 19,114 | 147.03 |
| 1948–62 | 9,846 | 103.97 | 12,378 | 119.02 | 14,591 | 130.86 | 17,076 | 141.71 | 20,019 | 153.99 |
| 1949–62 | 9,846 | 103.97 | 12,163 | 116.95 | 14,303 | 128.28 | 16,709 | 138.66 | 19,555 | 150.42 |
| 1947–63 | 9,846 | 103.97 | 12,146 | 116.79 | 14,254 | 127.84 | 16,624 | 137.96 | 19,426 | 149.43 |
| 1948–63 | 9,846 | 103.97 | 12,284 | 118.12 | 14,463 | 129.71 | 16,910 | 140.33 | 19,807 | 152.36 |
| 1949–63 | 9,846 | 103.97 | 12,352 | 118.77 | 14,566 | 130.64 | 17,052 | 141.51 | 19,998 | 153.83 |

eral statistical practice of excluding the affected observation from the analysis seems appropriate.

This practice, however, has not been generally applied to high or low observations which reflect cyclical fluctuations. For most grades of paper and board these cyclical fluctuations are large enough to have a tilt effect on the slope of the line describing the relationship. This can be of major importance if the peak or trough of a cycle near the beginning or ending of the base period where observations have the maximum impact on the slope of the relationship and the level of the projection. Thus, the effects of using observations which may be high or low because of cyclical fluctuations must be carefully considered if they occur in these critical periods. It may be desirable to adjust such observations to the trend level of consumption as defined by the regression line.

### *In projecting demands for paper and board it is desirable to make separate projections for the major grades but the sum of these projections may be about the same as a single projection of total demand*

As indicated in the introduction to this section, the various grades of paper and board were classified into several major grades in common use in industry and government. Such a classification provides more useful information for the paper and board industry where most firms are interested in prospective growth trends in specific grades. In addition, better estimates of wood pulp requirements (shown in the second section of the study) can be derived as both the use of new wood pulp and the mixture of the various types of new wood pulp vary widely among the different grades of paper and board manufactured. Because many grades of paper and board have shown widely varying rates of growth in consumption, it also seems logical to expect that more reliable pro-

TABLE 7.—*Comparison of projections of total demand for paper and board with sum of projections for major grades of paper and board (All projections derived from the use of the equation* $Y = a + b \log X$ *fitted to data in the period 1947–61)*

| Variable | Consumption | | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1963 | | 1970 | | 1975 | | 1980 | | 1985 | |
| | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| *Paper:* | | | | | | | | | | |
| Per capita paper consumption as a function of: | | | | | | | | | | |
| Per capita disposable personal income | 23,976 | 253 | 28,619 | 275.18 | 32,425 | 290.81 | 36,774 | 305.18 | 41,770 | 321.31 |
| Per capita gross national product | 23,976 | 253 | 28,191 | 271.07 | 32,070 | 287.62 | 36,473 | 302.68 | 41,445 | 318.81 |
| Sum of individual grades derived from separate grade analysis [1] | 23,976 | 253 | 28,651 | 275.49 | 32,522 | 291.68 | 36,832 | 306.02 | 41,913 | 322.40 |
| *Board:* | | | | | | | | | | |
| Per capita board consumption as a function of: | | | | | | | | | | |
| Per capita disposable personal income | 19,937 | 211 | 24,889 | 239.32 | 29,066 | 260.68 | 33,769 | 280.24 | 39,312 | 302.40 |
| Per capita gross national product | 19,937 | 211 | 24,280 | 233.46 | 28,547 | 256.03 | 33,328 | 276.58 | 38,812 | 298.55 |
| Sum of individual grades derived from separate grade analysis [1] | 19,937 | 211 | 24,526 | 235.84 | 28,660 | 256.23 | 33,062 | 274.38 | 38,307 | 294.67 |
| *Paper and board:* | | | | | | | | | | |
| Per capita paper and board consumption as a function of: | | | | | | | | | | |
| Per capita disposable personal income | 43,913 | 464 | 53,507 | 514.49 | 61,488 | 551.46 | 70,531 | 585.32 | 81,078 | 623.68 |
| Per capita gross national product | 43,913 | 464 | 52,468 | 504.50 | 60,616 | 543.64 | 69,803 | 579.28 | 80,258 | 617.37 |
| Sum of individual grades derived from separate grade analysis [1] | 43,913 | 464 | 53,177 | 511.33 | 61,182 | 547.91 | 69,894 | 580.40 | 80,220 | 617.07 |

[1] The following independent variables were used to project demands for the individual grades for paper and board:
a. Per capita disposable personal income: Newsprint, book paper, fine paper, sanitary and tissue paper, container board, and bending board.
b. Per capita gross national product: Coarse and industrial paper and building board.
c. Population and residential construction: Construction paper.
d. Population and per capita gross national product: Other board.

jections can be obtained by working with the separate grades, particularly where the varying rates of growth have been related to growth in different sectors of the economy.

There is a question, however, as to whether a projection of total demand for paper and board obtained by summing the projections for the major grades would be statistically as reliable as one obtained by projecting such a total directly. The tests showed that the coefficients or indexes of determination, which may be the best indicators of the reliability of a projection, were slightly higher for a projection of all grades combined than for most of the projections made for individual grades. The tests also indicated, however, that when most of the factors which affect the level of a projection, such as the regression equation and base time period, were the same, the difference between the sum of the projections of individual grades and a projected total for all grades was small and of no practical significance (table 7).

## Some general guides on the use of regression equations in projecting longrun demands for the major grades of paper and board

This concludes the analysis of the series of regression equations tested for use in projecting longrun trends in demand for the major grades of paper and board. The analysis indicated that there are some general guides on the use of regression equations for this purpose. These are summarized as follows:

1. For those grades of paper and board where there has been little or no increase in per capita use in the time period used as the base for the projection, and no indication of change, population or households are the most logical choices for projecting longrun trends in demand (aggregate demand).
2. For those grades where there has been a slow increase in per capita use, presumably in response to growth in the output of goods and services or income, some measure of economic activity such as gross national product, disposable personal income, or industrial longrun trends in production are the most logical choices for projecting demand (aggregate demand).

3. For those grades where there has been a relatively rapid increase in per capita use, per capita gross national product or per capita disposable personal income are the most logical choices for projecting longrun trends in demand (per capita demand).
4. Simple regression equations are preferable to multiple regression equations for making longrun projections of demand for paper and board with the independent variables that are available for use.
5. An equation with the general form $Y = a + b \log X$ is preferable for making longrun projections of demand for most grades of paper and board. However, for grades where consumption has been rising rapidly, the equation $Y = a + b X$ may be the best choice, at least for the years immediately ahead. There was no evidence that the equation log $Y = a + b \log X$, in which constant income elasticity of demand is implicitly assumed, is a desirable choice for projecting longrun trends in demand for any grade of paper or board, although under some circumstances it may be appropriate for shortrun projections.
6. The post World War II years are preferable as the base time period for making longrun projections for all grades of paper and board. Observations for individual years, particularly those near the beginning and ending of the base period which show substantial deviation from the regression line describing the relationship, should be carefully examined and omitted if abnormal or special conditions prevailed. The effects of using observations which may be high or low because of cyclical fluctuations should also be carefully considered if they occur near the beginning or ending of the period used as the base for the projections.

The use of these guides will not necessarily result in more accurate forecasts of future trends in demand for the major grades of paper and board. Such use will, however, insure consideration of the important factors which determine the level of projections obtained from regression equations and provide a more logical foundation for projections.

The above guides provided the basis for choosing the independent variables, units of measurement, kind of equation (simple or multiple), form of equation, and base time period used in making the projections of demand for the major grades of paper and board, shown in the following section. Graphic analysis was also extensively used in appraising the results obtained from the use of regression equations $Y = a + b \log X$ and $Y = a + b X$, and in determining the projected values shown for each grade (see notes on tables 9 and 10).

# PROJECTED DEMANDS FOR PAPER AND BOARD, WOOD PULP, AND PULPWOOD

**"The question is not whether economic analysis can, in a changing economy, give highly accurate forecasts on which to base plans. It is whether economics can give a better answer than would otherwise be obtainable."** [35]

This section of the report presents projections of demand for the major grades of paper and board to 1985 by 5-year intervals. These projections are also converted into equivalent demands for wood pulp and pulpwood. The discussion begins with the basic assumptions which in large part determine the level of the projections.

## Basic Assumptions

The preceding analysis indicated that it is desirable to use several different independent variables, such as population, gross national product and disposable personal income (total and per capita), industrial production, and construction in projecting demands for the various grades of paper and board. The future values of these variables are shown in table 8 and discussed below. There is, of course, a lot of uncertainty associated with these long range estimates because it is not known to what degree the underlying determinants such as fertility rates, productivity of the labor force, institutions, and technology will change.

### *Population estimated at 255 million in 1985 —about 29 percent above 1966*

Population has been one of the major determinants of aggregate demand for paper and board. In the 21 years between 1945 and 1966, population rose from about 140 million to 197 million, an increase of 41 percent (table 8; fig. 14). Recent projections indicate [20] that population growth will continue although at a slower rate. On the basis of such expectations, it was assumed that population would amount to 255 million in 1985. This represents an annual rate of growth of about 1.4 percent, which is somewhat below the average of 1.6 percent between 1945 and 1966.

The assumed population in 1985 and the other projection years shown in table 8 is close to the median of a series of projections published by the Bureau of the Census in 1964 [36] and revised series published in 1966 [37] and 1967.[38] The median of the most recent Census series [38] is below (about 7 percent in 1985) that of the Census series prepared in 1960.[39] It is, however, substantially above the projections used a decade or so ago.[40]

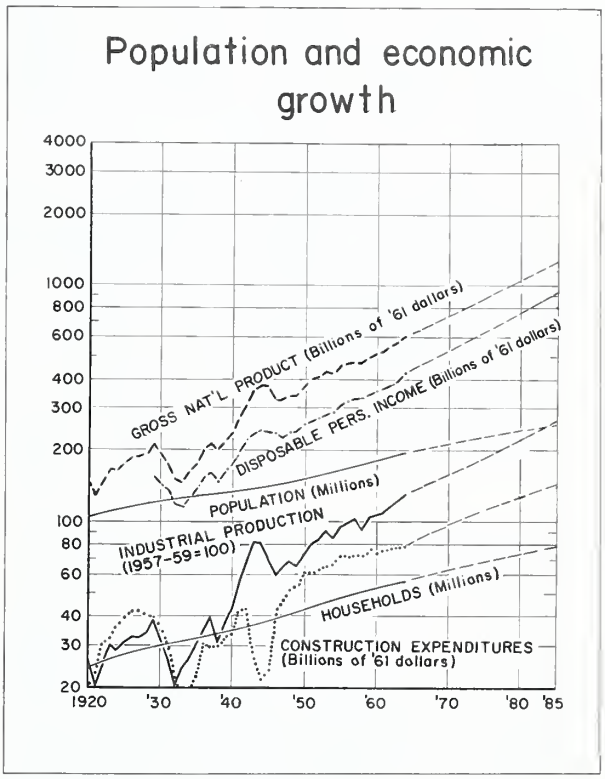


FIGURE 14.

[35] Dana, S. T. *Functions of forest economics research.* In Research in the economics of forestry. Washington: Charles Lathrup Pack Forestry Foundation. 1953.
[36] U.S. Department of Commerce, Bureau of the Census. *Projections of the population of the United States, by age and sex: 1964 to 1985 with extensions to 2010.*
[37] U.S. Department of Commerce, Bureau of the Census. *Revised projections of the population of the United States, by age and sex to 1985.*
[38] U.S. Department of Commerce, Bureau of the Census. *Projections of the population of the United States by age, sex, and color to 1990, with extensions of total population to 2015.*
[39] U.S. Congress, Senate Select Committee on National Water Resources, op. cit.
[40] U.S. Department of Agriculture, Forest Service. *Timber resources in America's future.*

TABLE 8.—*Measures of population and economic growth, 1920–85*

| Year | Population | Households | Gross national product (1961 prices) | | Disposable personal income (1961 prices) | | Index of industrial production | Construction expenditures (1961 prices) | Number of housing starts |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Per capita | Total | Per capita | | | |
| | *Millions* | *Millions* | *Billion dollars* | *Dollars* | *Billion dollars* | *Dollars* | *(1957–59=100)* | *Billion dollars* | *Thousands* |
| 1920 | 106.5 | 24.5 | 142.8 | 1,340 | -- | -- | 26.2 | 19.1 | -- |
| 1925 | 115.8 | 27.5 | 179.5 | 1,550 | -- | -- | 31.5 | 39.8 | -- |
| 1930 | 123.1 | 30.0 | 191.7 | 1,560 | 144.4 | 1,170 | 32.0 | 34.3 | -- |
| 1935 | 127.3 | 31.9 | 177.4 | 1,390 | 136.9 | 1,080 | 30.7 | 22.4 | -- |
| 1940 | 132.1 | 34.9 | 237.6 | 1,800 | 172.8 | 1,310 | 43.9 | 34.5 | -- |
| 1945 | 139.9 | 37.5 | 371.7 | 2,660 | 238.7 | 1,710 | 70.5 | 23.8 | -- |
| 1950 | 152.3 | 43.6 | 371.6 | 2,440 | 259.4 | 1,700 | 74.9 | 61.8 | 1,726 |
| 1955 | 165.9 | 47.9 | 458.1 | 2,760 | 308.3 | 1,860 | 96.6 | 72.4 | 1,643 |
| 1960 | 180.7 | 52.8 | 510.2 | 2,820 | 353.4 | 1,960 | 108.7 | 73.9 | 1,296 |
| 1961 | 183.8 | 53.5 | 520.1 | 2,830 | 364.4 | 1,980 | 109.7 | 75.2 | 1,365 |
| 1962 | 186.7 | 54.7 | 554.1 | 2,970 | 382.0 | 2,050 | 118.3 | 78.3 | 1,492 |
| 1963 | 189.4 | 55.2 | 576.3 | 3,040 | 396.2 | 2,090 | 124.3 | 79.9 | 1,641 |
| 1964 | 192.1 | 56.0 | 606.6 | 3,160 | 422.4 | 2,200 | 132.3 | 82.4 | 1,591 |
| 1965 | 194.6 | 57.3 | 642.6 | 3,300 | 447.6 | 2,300 | 143.4 | 86.5 | 1,543 |
| 1966[1] | 196.8 | 58.1 | 678.6 | 3,450 | 463.5 | 2,360 | 155.7 | 86.7 | 1,252 |
| PROJECTIONS | | | | | | | | | |
| 1970 | 206 | 62.5 | 785 | 3,810 | 550 | 2,670 | 165 | 110 | 1,630 |
| 1975 | 220 | 67.5 | 945 | 4,300 | 660 | 3,000 | 200 | 125 | 1,770 |
| 1980 | 236 | 73.5 | 1,135 | 4,810 | 790 | 3,350 | 235 | 145 | 1,920 |
| 1985 | 255 | 79.5 | 1,365 | 5,350 | 960 | 3,760 | 280 | 160 | 2,080 |

[1] Preliminary.

Sources: Population, U.S. Department of Commerce, Bureau of the Census. *Population estimates.* Cur. Pop. Rpts. 333 and 355. 1966.

Households, U.S. Department of Commerce, Bureau of the Census. *Historical statistics of the United States, colonial times to 1957.* 1960, and *Population characteristics.* Cur Pop. Rpt. 152. 1966.

Gross national product, derived from data published by the U.S. Congress, Joint Committee on the Economic Report. *Potential economic growth of the United States during the next decade.* 83d Cong., 2d sess., 1954; the U.S. Department of Commerce, Office of Business Economics, op. cit. 45 (8), 1965; and the Council of Economic Advisors. *Economic indicators.* Monthly.

Disposable personal income, derived from data published by the U.S. Department of Commerce, Office of Business Economics, op. cit., and the Council of Economics Advisors, op. cit.

Index of industrial production, Board of Governors of the Federal Reserve System. *Industrial production 1957–59 base,* and the Council of Economic Advisors, op. cit.

Construction expenditures, derived from data published by the U.S. Departments of Labor and Commerce. *Construction volume and costs 1915–1956.* Construct. Rev. 1958, and the U.S. Department of Commerce, Bureau of the Census. *Construction activity.* Construct. Rpts. C30. Monthly.

Housing starts, U.S. Department of Commerce, Bureau of the Census. *Housing starts.* Construct. Rpts. C20. Monthly, and U.S. Department of Agriculture, Forest Service.

Projections, U.S. Department of Agriculture, Forest Service.

### *Gross national product to about double by 1985—most other related measures of economic activity show similar increases*

On the basis of the assumed increase in population and the further assumption that recent trends in the proportion of the population in the labor force, hours worked, and man-hour productivity will continue, the gross national product was projected to rise from $679 billion in 1966 to $1,365 billion in 1985[41] (1961 prices) (table 8; fig. 14). This represents an annual rate of increase of 3.75 percent, slightly above the average rate in the last decade and a half but substantially below that since 1962. Per capita gross national product in 1985 is assumed to average $5,350, about 55 percent above the average of $3,450 in 1966.

Other measures of economic activity are also expected to show rapid growth. Disposable personal income is projected to $960 billion (1961 prices) in 1985—an increase of about 107 percent over 1966. Per capita disposable personal income, the preferred independent variable for projecting demands for most grades of paper and board, rises from $2,360 in 1966 to $3,760 in 1985.

### *Relative price relationships assumed to remain about the same*

As indicated earlier, prices of paper and board relative to the prices of other commodities have been fairly stable in the last decade and a half (fig. 4; app. C, tables 1 and 2). In making the projections of demand for the

[41] Projections of gross national product and the other measures of economic activity used in this study are above those shown on p. 8 of *Timber trends in the United States.* This upward revision brings the projections more in line with recent growth in economic activity and current expectations of future growth.

major grades of paper and board, it was assumed that the recent relationships would continue through the projection period.

Implicit in this assumption are further assumptions that there will be adequate supplies of wood and other raw materials available to the pulp and paper industry and that technological improvements will keep pace with those in competing industries. These seem reasonable expectations in view of the prospective supplies of wood and other raw materials in the projection period and the long history of technological progress in the paper, board, and wood pulp industries.

It is, of course, possible that growth in demand for paper and board, wood pulp, and pulpwood of the magnitudes envisaged in this study will result in price increases because of limitations on labor, raw materials, or capital. However, there are reasons for believing that the demand for paper and board is rather insensitive to changes in price and thus is not likely to be much affected by any price change which could reasonably be assumed to be in prospect in the projection period.[42] This price insensitivity, or inelastic demand, reflects in part the lack of acceptable substitutes for paper or board in most end uses. It also reflects the low cost of paper or board to final consumers. In fact for many items such as books, tissue paper, and various kinds of containers, the cost to the final consumer is so small in relation to the total price of the product or the income of the consumer that even fairly large changes in tonnage prices are unlikely to have much impact on consumption.

### *Many assumptions underlie projections of demand*

There are many implicit assumptions as well as specified underlying the projections of demand for paper and board. For example, historical statistics were used in making all projections. These statistics are in part the end result of forces, such as the educational level of the population and consumer tastes, that are not explicitly recognized but which are implicitly assumed to continue to change much as they have in the past.

Because of such simplifying assumptions and the use of simple mathematical equations, all projections are "trend" projections which do not show cyclical or random fluctuations. The meaning of a trend projection is illustrated in figure 2. The solid line in this figure was calculated from a regression equation $Y = a + b \log X$ and is the trend level of consumption with this equation. Actual consumption, as shown by the dots in figure 2, fluctuated around this trend level. This fluctuation, caused by many factors, is expected to continue, and actual demand is likely to vary around the projected trend level much as it has in the past.

Because projections of demand for the major grades of paper and board are determined by many stated and implicit assumptions, they must be regarded as conditional statements which indicate the level of consumption that would come about if the assumptions concerning the form of the relationships, population, income, and all other determinants were realized. This, of course, is not likely to happen. It is therefore highly desirable to rerun projections at fairly frequent intervals so that unforeseen changes in relationships and turning points in the trends in such factors as population, economic growth, consumption, productivity, technological developments, and prices can be taken into account.

## Projected Demand for Paper and Board

### *Paper and board consumption was 52.4 million tons in 1966—projections indicate a rise to 101.5 million tons by 1985*

In 1966 the consumption of paper and board was 52.4 million tons (table 9; figs. 15 and 16).[43] This was twice use in 1948 and more than five times the volume consumed in 1926—just four decades ago.

The projections of demand for all grades of paper and board combined as developed in this study rise to 72.1 million tons in 1975 and to 101.5 million tons in 1985 (table 9; figs. 15 and 16). Demand in this latter year is nearly double consumption in 1966.

As indicated in the following tabulation, these projections of demand are somewhat above the median of projections recently prepared by the Department of Commerce,[44] Resources for the Future, Inc.,[45] and the American Paper Institute.[46]

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[42] Because prices were fairly stable in recent years, it is impossible to derive a quantitative measure of their impact on consumption.

[43] Annual data on production, trade, and consumption of paper and board, by major grades, are shown in the tables in appendix D.

[44] U.S. Congress, House Committee on Interstate and Foreign Commerce, op. cit.

[45] Resources for the Future, Inc., op. cit., p. 707.

[46] Slatin, Benjamin. *U.S. integrated pulp and paper mills keep pace with changing markets.* Pulp and Paper 40 (26) : 34–36. June 1966.

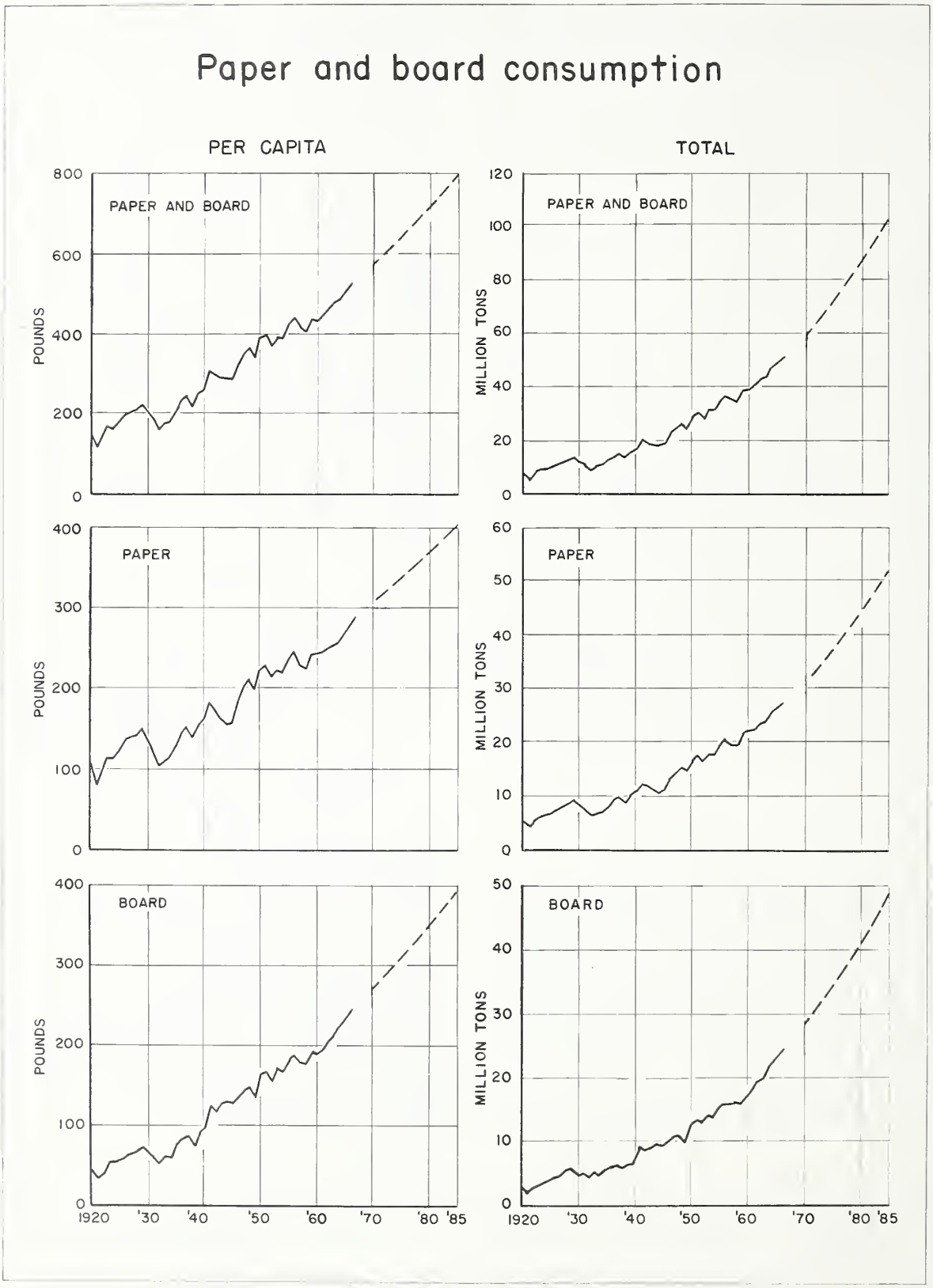
Paper and board consumption
PER CAPITA
TOTAL
PAPER AND BOARD
PAPER
BOARD
POUNDS
MILLION TONS
0
200
400
600
800
20
40
60
80
100
120
100
200
300
400
10
30
50
60
1920
'30
'40
'50
'60
'70
'80
'85

FIGURE 15.

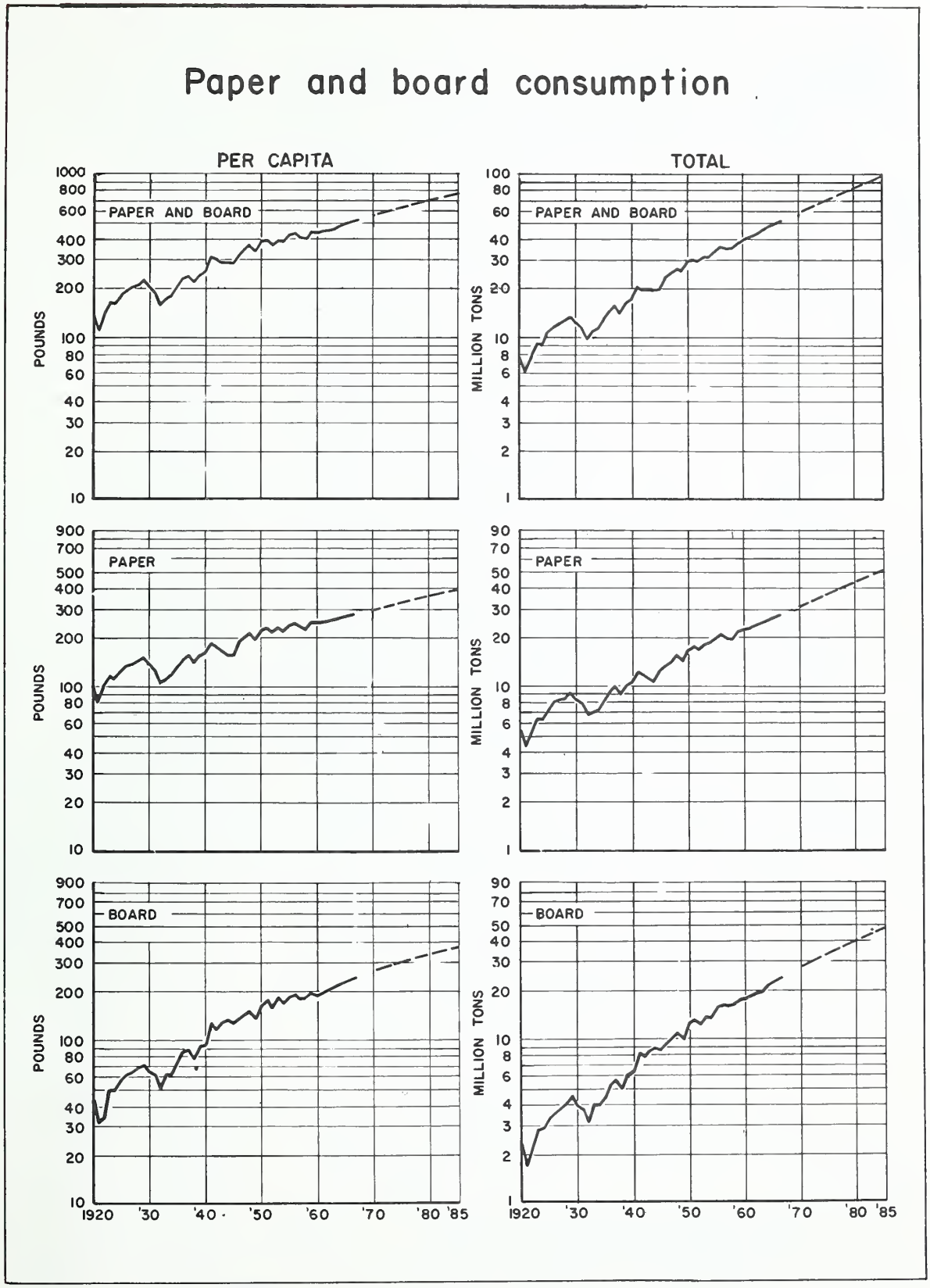
Paper and board consumption
PER CAPITA
TOTAL
POUNDS
MILLION TONS
PAPER AND BOARD
PAPER
BOARD
1000
800
600
400
300
200
100
80
60
40
30
20
10
900
700
500
400
300
200
100
80
60
40
30
20
10
100
80
60
40
30
20
10
8
6
4
3
2
1
90
70
50
40
30
20
10
8
6
4
3
2
1
1920
'30
'40
'50
'60
'70
'80
'85

FIGURE 16.

TABLE 9.—*Apparent consumption of paper and board by grade, 1920–85*

| Year | Total paper and board | | Total paper | | Newsprint | | Groundwood paper | | Book paper | | | | | | Fine paper | | Coarse and industrial paper | | Sanitary and tissue paper | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total [1] | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Coated | Annual rate of increase [2] | Uncoated | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total | Annual rate of increase [2] |
| | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* |
| 1920 | 7.7 | -- | 5.4 | -- | 2.2 | -- | 0.2 | -- | 0.9 | -- | -- | -- | -- | -- | 0.4 | -- | 1.2 | -- | 0.2 | -- |
| 1925 | 10.4 | 6.2 | 7.1 | 5.6 | 3.0 | 6.4 | .2 | -- | 1.2 | 5.9 | -- | -- | -- | -- | .5 | 4.6 | 1.4 | 8.1 | .3 | 8.4 |
| 1930 | 12.3 | 3.4 | 8.4 | 3.4 | 3.5 | 3.1 | .2 | -- | 1.4 | 8.1 | -- | -- | -- | -- | .7 | 7.0 | 1.8 | 5.2 | .4 | 5.9 |
| 1935 | 12.3 | .3 | 8.2 | -- | 3.4 | -- | .4 | 14.9 | 1.3 | -- | -- | -- | -- | -- | .6 | -- | 1.7 | -- | .5 | 4.6 |
| 1940 | 16.8 | 5.6 | 10.6 | 5.3 | 3.7 | 1.7 | .6 | 8.4 | 1.6 | 4.2 | -- | -- | -- | -- | .7 | 8.1 | 2.6 | 8.9 | .7 | 7.0 |
| 1945 | 19.8 | 8.3 | 11.0 | .7 | 3.5 | -- | .6 | -- | 1.5 | -- | 0.3 | -- | 1.1 | -- | .9 | 5.2 | 2.7 | .3 | 1.0 | 7.4 |
| 1950 | 29.1 | 3.0 | 16.8 | 3.8 | 5.9 | 11.0 | .7 | 3.1 | 2.6 | 11.6 | 1.0 | 27.2 | 1.6 | 7.3 | 1.2 | 5.9 | 3.7 | 6.5 | 1.4 | 7.0 |
| 1955 | 35.0 | 3.3 | 19.4 | 2.9 | 6.5 | 2.0 | .9 | 5.2 | 3.0 | 2.9 | 1.3 | 5.4 | 1.8 | 2.4 | 1.4 | 3.1 | 4.2 | 2.6 | 1.3 | 5.2 |
| 1960 | 39.3 | 2.3 | 22.1 | 2.6 | 7.4 | 2.6 | .9 | -- | 3.3 | 4.8 | 1.3 | 6.7 | 1.9 | 1.1 | 1.7 | 4.0 | 4.7 | 2.3 | 2.2 | 4.1 |
| 1961 | 40.5 | 3.1 | 22.5 | 1.8 | 7.4 | -- | .9 | -- | 3.8 | -- | 2.1 | 16.7 | 1.7 | -- | 1.9 | 11.8 | 4.8 | 2.1 | 2.3 | 4.5 |
| 1962 | 42.8 | 4.4 | 23.2 | 3.6 | 7.5 | 1.4 | .9 | -- | 4.0 | 5.3 | 2.2 | 4.3 | 1.8 | 5.9 | 2.0 | 5.3 | 5.0 | 4.2 | 2.4 | 4.4 |
| 1963 | 43.9 | 3.8 | 24.0 | 3.4 | 7.6 | 1.3 | 1.0 | 11.1 | 4.3 | 7.5 | 2.4 | 9.1 | 1.9 | 5.6 | 2.1 | 5.0 | 5.1 | 2.0 | 2.6 | 8.3 |
| 1964 | 46.6 | 6.1 | 25.4 | 5.8 | 8.1 | 6.6 | 1.0 | -- | 4.6 | 7.0 | 2.6 | 3.3 | 2.0 | 5.3 | 2.2 | 4.3 | 5.2 | 2.0 | 2.7 | 3.9 |
| 1965 [3] | 48.9 | 4.9 | 26.6 | 4.7 | 8.4 | 3.7 | 1.0 | -- | 5.0 | 3.7 | 2.8 | 7.7 | 2.2 | 10.0 | 2.4 | 9.1 | 5.5 | 5.8 | 2.8 | 3.7 |
| 1966 [3] | 52.3 | 7.0 | 28.4 | 6.8 | 9.1 | 8.3 | 1.1 | 10.0 | 5.5 | 10.0 | 3.0 | 7.1 | 2.5 | 13.6 | 2.6 | 8.3 | 5.6 | 1.8 | 3.0 | 7.1 |
| PROJECTED DEMAND | | | | | | | | | | | | | | | | | | | | |
| 1970 | 60.3 | 4.3 | 32.0 | 3.8 | 9.7 | 2.9 | 1.2 | 3.7 | 6.3 | 4.7 | 3.8 | 6.3 | 2.5 | 2.6 | 3.1 | 5.3 | 6.3 | 2.8 | 3.7 | 5.7 |
| 1975 | 72.1 | 8.6 | 87.7 | 3.3 | 11.0 | 2.5 | 1.3 | 1.6 | 7.3 | 4.4 | 5.0 | 5.6 | 2.8 | 2.3 | 3.7 | 3.6 | 7.4 | 3.3 | 4.7 | 4.9 |
| 1980 | 85.9 | 8.6 | 44.4 | 3.3 | 12.5 | 2.6 | 1.4 | 1.5 | 9.5 | 4.0 | 6.8 | 4.7 | 3.2 | 2.7 | 4.6 | 4.4 | 8.6 | 3.1 | 5.9 | 4.7 |
| 1985 | 101.5 | 3.4 | 51.7 | 3.1 | 14.3 | 2.7 | 1.5 | 1.4 | 11.4 | 3.7 | 7.3 | 4.4 | 3.6 | 2.4 | 5.6 | 4.0 | 9.8 | 2.6 | 7.1 | 3.8 |

| Year | Construction paper | | Total board | | Container board | | Bending board | | | | | | Building board | | | | | | Other board | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Special food board | Annual rate of increase [2] | Folding box-board | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Insulating board | Annual rate of increase [2] | Hardboard | Annual rate of increase [2] | Total | Annual rate of increase [2] |
| | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* |
| 1920 | 0.4 | -- | 2.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1925 | .6 | 3.4 | 3.3 | 7.5 | -- | -- | -- | -- | -- | -- | -- | -- | 0.1 | -- | -- | -- | -- | -- | -- | -- |
| 1930 | .5 | -- | 3.9 | 3.4 | -- | -- | 1.0 | -- | -- | -- | -- | -- | .1 | -- | -- | -- | -- | -- | -- | -- |
| 1935 | .4 | -- | 4.6 | 3.4 | -- | -- | 1.1 | 1.9 | -- | -- | -- | -- | .1 | -- | -- | -- | -- | -- | -- | -- |
| 1940 | .7 | 11.8 | 6.2 | 6.2 | 3.3 | -- | 1.4 | 4.9 | -- | -- | -- | -- | .2 | 14.9 | -- | -- | -- | -- | 1.3 | -- |
| 1945 | .9 | 5.2 | 8.8 | 7.3 | 4.1 | 4.4 | 2.3 | 10.4 | 0.4 | -- | 1.9 | -- | .9 | 35.0 | 0.6 | -- | 0.3 | -- | 1.6 | 4.2 |
| 1950 | 1.4 | 9.2 | 12.8 | 6.9 | 5.3 | 7.2 | 3.1 | 6.2 | .7 | 11.3 | 2.5 | 5.6 | 1.2 | 5.9 | .3 | 5.9 | .4 | 5.9 | 2.1 | 5.6 |
| 1955 | 1.6 | 2.7 | 15.6 | 4.9 | 7.4 | 5.0 | 3.9 | 4.7 | 1.2 | 11.4 | 2.8 | 2.3 | 1.7 | 7.2 | 1.1 | 6.6 | .6 | 3.4 | 2.6 | 4.4 |
| 1960 | 1.4 | -- | 17.2 | 2.0 | 8.2 | 2.1 | 4.4 | 2.4 | 1.5 | 4.6 | 2.9 | .7 | 1.9 | 2.2 | 1.1 | -- | .8 | 5.9 | 2.7 | .8 |
| 1961 | 1.4 | -- | 18.0 | 4.6 | 8.8 | 7.3 | 4.5 | 2.3 | 1.6 | 6.7 | 2.9 | -- | 1.9 | -- | 1.1 | -- | .9 | 12.5 | 2.8 | 3.7 |
| 1962 | 1.4 | -- | 19.1 | 6.1 | 9.5 | 8.0 | 4.9 | 2.1 | 1.7 | -- | 3.2 | 3.2 | 2.3 | 10.5 | 1.1 | -- | 1.0 | 11.1 | 2.8 | -- |
| 1963 | 1.4 | -- | 19.9 | 4.2 | 9.3 | 3.2 | 4.8 | 6.7 | 1.7 | 6.2 | 3.1 | 6.9 | 2.1 | 9.5 | 1.1 | -- | 1.1 | 10.0 | 2.9 | 3.6 |
| 1964 | 1.5 | 7.1 | 21.2 | 6.5 | 10.6 | 3.2 | 5.2 | 6.1 | 1.3 | 5.9 | 3.3 | 8.1 | 2.4 | 4.3 | 1.2 | 9.1 | 1.2 | 9.1 | 3.0 | 3.4 |
| 1965 [3] | 1.6 | 6.7 | 22.3 | 5.2 | 11.3 | 6.6 | 5.4 | 3.3 | 2.1 | 16.7 | 3.3 | -- | 2.5 | 4.2 | 1.3 | 8.3 | 1.2 | -- | 3.2 | 6.7 |
| 1966 [3] | 1.5 | -- | 23.9 | 7.2 | 12.5 | 10.6 | 5.7 | 5.6 | 2.2 | 4.3 | 3.5 | 6.1 | 2.4 | -- | 1.2 | -- | 1.2 | -- | 3.3 | 3.1 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 1.7 | 1.2 | 28.3 | 4.8 | 14.6 | 5.3 | 7.1 | 5.6 | 3.0 | 7.4 | • 4.1 | 4.4 | 3.2 | 5.1 | 1.4 | 1.5 | 1.8 | 9.6 | 3.4 | 1.2 |
| 1975 | 1.8 | 1.1 | 34.4 | 4.0 | 18.2 | 4.5 | 8.4 | 3.4 | 3.7 | 4.3 | 4.7 | 2.8 | 3.9 | 4.0 | 1.6 | 2.7 | 2.3 | 8.9 | 3.9 | 2.8 |
| 1980 | 1.9 | 1.1 | 41.5 | 3.8 | 22.4 | 4.2 | 9.9 | 3.3 | 4.6 | 4.5 | 5.3 | 2.4 | 4.7 | 3.8 | 1.8 | 2.4 | 2.9 | 4.7 | 4.5 | 2.9 |
| 1985 | 2.0 | 1.0 | 49.8 | 3.7 | 27.4 | 4.1 | 11.6 | 3.2 | 5.6 | 4.0 | 6.0 | 2.5 | 5.6 | 3.6 | 2.0 | 2.1 | 3.6 | 4.4 | 5.2 | 2.9 |

[1] Data may not add to totals because of rounding.

[2] The average annual rate of increase for 5-year periods ending in the specified years except for the years 1961–66 when annual changes are shown.

[3] Preliminary.

NOTE: Projections were derived as follows: First, the mathematical projections obtained from the equations $Y = a + b\ X$ and $Y = a + b \log X$ (see table 11) were plotted on charts similar to those shown for each of the major grades of paper and board on following pages. Second, curves were fitted by eye to the historic trends (including preliminary 1966 data) and extended on a judgment basis through the projection period using the mathematical projections as the upper ($Y = a + b\ X$) and lower ($Y = a + b \log X$) limits. Thus, for most grades of paper and board, the projections fall somewhere between the mathematical projections shown in table 11 and have the general form of the equation $Y = a + b \log X$.

Sources: American Paper Institute. *The statistics of paper.* Annual, 1960 ed. and 1965 sup., and *Monthly statistical summary* (3), New York; U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board.* Cur. Indus. Rpts. Ser. M26A. Annual; U.S. Department of Commerce, Business and Defense Services Administration. *Pulp, paper and board.* Quart. Indus. Rpt; and U.S. Department of Agriculture, Forest Service.

TABLE 10.—*Apparent per capita consumption of paper and board by grade, 1920–85*

| Year | Total paper and board | | Total paper | | Newsprint | | Groundwood paper | | Book paper | | | | | | Fine paper | | Coarse and industrial paper | | Sanitary and tissue paper | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total [1] | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Coated | Annual rate of increase [2] | Uncoated | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total | Annual rate of increase [2] |
| | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* |
| 1920 | 145 | -- | 102 | -- | 41 | -- | 3 | -- | 17 | -- | -- | -- | -- | -- | 7 | -- | 23 | -- | 4 | -- |
| 1925 | 180 | 4.4 | 123 | 3.8 | 52 | 4.9 | 3 | -- | 20 | 3.3 | -- | -- | -- | -- | 9 | 5.2 | 25 | 1.7 | 5 | 4.6 |
| 1930 | 201 | 2.2 | 137 | 2.2 | 57 | 1.9 | 4 | 5.9 | 22 | 1.9 | -- | -- | -- | -- | 12 | 5.9 | 29 | 3.0 | 6 | 3.7 |
| 1935 | 201 | -- | 129 | -- | 53 | -- | 6 | 8.4 | 20 | -- | -- | -- | -- | -- | 10 | -- | 27 | -- | 7 | 3.1 |
| 1940 | 254 | 4.8 | 161 | 4.5 | 57 | 1.5 | 9 | 8.4 | 25 | 4.6 | -- | -- | -- | -- | 11 | 1.9 | 39 | 7.6 | 11 | 9.5 |
| 1945 | 283 | 2.2 | 157 | -- | 49 | -- | 9 | -- | 21 | -- | 5 | -- | 16 | -- | 13 | 3.4 | 38 | -- | 14 | 4.9 |
| 1950 | 382 | 6.2 | 221 | 7.1 | 77 | 9.5 | 9 | -- | 34 | 10.1 | 13 | 21.1 | 21 | 5.6 | 15 | 2.9 | 49 | 5.2 | 18 | 5.2 |
| 1955 | 422 | 2.0 | 234 | 1.1 | 78 | .3 | 11 | 4.1 | 37 | 1.7 | 16 | 4.2 | 21 | -- | 17 | 2.5 | 51 | .8 | 21 | 3.1 |
| 1960 | 435 | .6 | 244 | .8 | 81 | .8 | 10 | -- | 42 | 2.6 | 21 | 5.6 | 21 | -- | 19 | 2.2 | 52 | .4 | 24 | 2.7 |
| 1961 | 440 | 1.1 | 245 | .4 | 81 | -- | 10 | -- | 41 | -- | 23 | 9.5 | 18 | -- | 21 | 10.5 | 52 | -- | 25 | 4.2 |
| 1962 | 454 | 3.2 | 249 | 1.6 | 80 | -- | 10 | -- | 43 | 4.9 | 24 | 4.3 | 19 | 5.6 | 22 | 4.8 | 53 | 1.9 | 26 | 4.0 |
| 1963 | 464 | 2.2 | 253 | 1.6 | 80 | -- | 10 | -- | 45 | 4.7 | 25 | 4.2 | 20 | 5.3 | 22 | -- | 54 | 1.9 | 27 | 3.8 |
| 1964 | 485 | 4.5 | 264 | 4.3 | 84 | 5.0 | 10 | -- | 48 | 6.7 | 27 | 8.0 | 21 | 5.0 | 23 | 4.6 | 55 | 1.9 | 28 | 3.7 |
| 1965 [3] | 503 | 3.7 | 273 | 3.4 | 86 | 2.4 | 11 | 10.0 | 51 | 6.3 | 29 | 7.4 | 23 | 9.5 | 24 | 4.4 | 56 | 1.8 | 29 | 3.6 |
| 1966 [3] | 531 | 5.6 | 289 | 5.9 | 93 | 8.1 | 11 | -- | 56 | 9.8 | 30 | 3.4 | 25 | 8.7 | 26 | 8.3 | 57 | 1.8 | 36 | 4.4 |
| PROJECTED DEMAND | | | | | | | | | | | | | | | | | | | | |
| 1970 | 584 | 3.0 | 310 | 2.6 | 94 | 1.8 | 12 | 1.8 | 61 | 3.6 | 37 | 5.0 | 24 | .9 | 30 | 4.6 | 61 | 1.7 | 36 | 4.4 |
| 1975 | 654 | 2.3 | 342 | 2.0 | 100 | 1.2 | 12 | -- | 70 | 2.8 | 45 | 4.0 | 25 | .8 | 34 | 2.5 | 67 | 1.9 | 43 | 3.6 |
| 1980 | 728 | 2.2 | 376 | 1.9 | 106 | 1.2 | 12 | -- | 80 | 2.7 | 53 | 3.3 | 27 | 1.6 | 39 | 2.8 | 73 | 1.7 | 50 | 3.1 |
| 1985 | 797 | 1.8 | 406 | 1.5 | 112 | 1.1 | 12 | -- | 89 | 2.2 | 61 | 2.9 | 28 | .7 | 44 | 2.4 | 77 | 1.1 | 56 | 2.3 |

| Year | Construction paper | | Total board | | Container board | | Bending board | | | | | | Building board | | | | | | Other board | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Total | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Special food board | Annual rate of increase [2] | Folding boxboard | Annual rate of increase [2] | Total [1] | Annual rate of increase [2] | Insulating board | Annual rate of increase [2] | Hardboard | Annual rate of increase [2] | Total | Annual rate of increase [2] |
| | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* | *Pounds* | *Percent* |
| 1920 | 7 | -- | 43 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1925 | 10 | 7.4 | 57 | 5.8 | -- | -- | -- | -- | -- | -- | -- | -- | 1 | -- | -- | -- | -- | -- | -- | -- |
| 1930 | 8 | -- | 64 | 2.3 | -- | -- | 17 | -- | -- | -- | -- | -- | 2 | 14.9 | -- | -- | -- | -- | -- | -- |
| 1935 | 7 | -- | 72 | 2.4 | -- | -- | 18 | 1.1 | -- | -- | -- | -- | 1 | -- | -- | -- | -- | -- | -- | -- |
| 1940 | 10 | 7.4 | 93 | 5.3 | 50 | -- | 21 | 3.1 | -- | -- | -- | -- | 2 | 14.9 | -- | -- | -- | -- | 20 | -- |
| 1945 | 12 | 3.7 | 126 | 6.3 | 58 | 3.0 | 32 | 3.8 | 5 | -- | 27 | -- | 13 | 45.4 | 9 | -- | 4 | -- | 23 | 2.8 |
| 1950 | 19 | 9.6 | 161 | 5.0 | 76 | 5.6 | 41 | 5.1 | 9 | 12.5 | 33 | 4.1 | 16 | 4.2 | 11 | 4.1 | 5 | 4.6 | 28 | 4.0 |
| 1955 | 19 | -- | 188 | 3.1 | 89 | 3.2 | 47 | 2.8 | 14 | 9.2 | 34 | .6 | 20 | 4.6 | 13 | 3.4 | 7 | 7.0 | 31 | 2.1 |
| 1960 | 16 | -- | 191 | .3 | 91 | .4 | 49 | .8 | 16 | 2.7 | 33 | -- | 21 | 1.0 | 12 | -- | 9 | 5.2 | 30 | -- |
| 1961 | 15 | -- | 196 | 2.6 | 96 | 5.5 | 49 | -- | 17 | 6.2 | 31 | -- | 21 | -- | 12 | -- | 9 | -- | 30 | -- |
| 1962 | 15 | -- | 205 | 4.6 | 101 | 5.2 | 51 | 4.1 | 19 | 11.8 | 33 | 6.5 | 22 | 4.8 | 12 | -- | 11 | 22.2 | 30 | -- |
| 1963 | 15 | -- | 211 | 2.9 | 104 | 3.0 | 52 | 2.0 | 18 | -- | 33 | -- | 24 | 9.1 | 12 | -- | 12 | 9.1 | 31 | 3.3 |
| 1964 | 16 | 6.7 | 221 | 4.7 | 110 | 5.8 | 54 | 3.8 | 19 | 5.6 | 35 | 6.1 | 25 | 4.2 | 13 | 8.3 | 13 | 8.3 | 32 | 3.2 |
| 1965 [3] | 16 | -- | 229 | 3.6 | 116 | 5.5 | 55 | 1.9 | 21 | 10.5 | 34 | -- | 26 | 4.0 | 13 | -- | 13 | -- | 32 | -- |
| 1966 [3] | 15 | -- | 243 | 6.1 | 127 | 9.5 | 58 | 5.5 | 22 | 4.8 | 36 | 5.9 | 24 | -- | 12 | -- | 12 | -- | 33 | 3.1 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1970 | 16 | -- | 274 | 3.7 | 142 | 4.1 | 69 | 4.6 | 29 | 6.7 | 40 | 3.3 | 30 | 2.9 | 13 | -- | 17 | 5.5 | 33 | .6 |
| 1975 | 16 | -- | 312 | 2.6 | 165 | 3.0 | 77 | 2.2 | 34 | 3.2 | 43 | 1.5 | 35 | 3.1 | 14 | 1.5 | 21 | 4.3 | 35 | 1.2 |
| 1980 | 16 | -- | 352 | 2.4 | 190 | 2.9 | 84 | 1.8 | 39 | 2.8 | 45 | .9 | 40 | 2.7 | 15 | 1.4 | 25 | 3.6 | 38 | 1.7 |
| 1985 | 16 | -- | 391 | 2.1 | 215 | 2.5 | 91 | 1.6 | 44 | 2.4 | 47 | .9 | 44 | 1.9 | 16 | 1.3 | 28 | 2.3 | 41 | 1.5 |

[1] Data may not add to totals because of rounding.

[2] The average annual rate of increase for 5-year periods in the specified years, except the years 1961–66 when annual changes are shown.

[3] Preliminary.

NOTE: Projections were derived as follows: First, the mathematical projections obtained from the equations $Y = a + b\,X$ and $Y = a + b \log X$ (see table 11) were plotted on charts similar to those shown for each of the major grades of paper and board on following pages. Second, curves were fitted by eye to the historic trends (including preliminary 1966 data) and extended on a judgment basis through the projection period using the mathematical projections as the upper ($Y = a + b\,X$) and lower ($Y = a + b \log X$) limits. Thus, for most grades of paper and board, the projections fall somewhere between the mathematical projections shown in table 11 and have the general form of the equation $Y = a + b \log X$.

Sources: Derived from data published by the American Paper Institute and the U.S. Department of Commerce, see source note, table 9.

| Year | U.S. Forest Service | | U.S. Department of Commerce | Resources for the Future, Inc. | American Paper Institute |
|---|---|---|---|---|---|
| | This study | Timber Trends | | | |
| | | | (Million Tons) | | |
| 1970 | 60.3 | 52.7 | 55.6–61.8 | 50.6–54.9–61.4 | 58.4 |
| 1975 | 72.1 | -- | -- | -- | 69.4 |
| 1980 | 85.9 | 69.3 | -- | 64.6–76.1–93.7 | -- |
| 1985 | 101.5 | -- | -- | -- | -- |

The projections are also substantially above those recently published by the Forest Service in the report *Timber Trends in the United States.*[47] About two-thirds of this difference reflects the use of higher projections of gross national product and the related measures of economic activity. The remainder is attributable to the use of more recent data, which include the rapid rise in consumption of paper and board and general economic activity that took place in 1963, 1964, 1965 and 1966; and further refinement in the projection methods.[48] In addition some of the increases in the projections of paper and board production and in wood pulp and pulpwood consumption and production shown in later tables reflects the use of higher projections (in comparison to the projections in the Timber Trends report) of exports of paper, board, and wood pulp.

Per capita paper and board consumption in 1966 was 533 pounds—about 50 percent higher than in 1948 (table 10; figs. 15 and 16). Projected per capita demand rises to 654 pounds in 1975 and to 797 pounds in 1985—levels that are respectively 23 percent and 50 percent above 1966.

The projections of per capita demand between 1970 and 1975 show an average annual rate of growth of 2.3 percent. Between 1980 and 1985, this average falls to 1.8 percent. These rates compare with the long-term average of 2.9 percent in the years 1926 through 1966 and the 1956–66 decadal average of 2.1 percent. Average annual rates of change in total consumption, although higher, show the same general pattern.

The projected drop in the average annual rate of growth in per capita and total consumption is a continuation of an historical trend as graphically illustrated in figure 16. The consumption data in this figure are plotted on a semilogarithmic scale and the slopes of the lines are direct indicators of annual rates of change. Although considerable fluctuation has occurred, it is apparent that the slopes have tended to flatten out slightly in recent decades, an indication that the rates of change have been declining.

### Projections show increase in demand for each of the major grades of paper and board but with wide differences in the size of increase

Projections of total demand for each of the major grades of paper and board and per capita demand for most grades are substantially higher than in 1966 (tables 9 and 10). However, the size of these increases varies widely among the individual grades.

*Newsprint.*—Newsprint is the paper used in printing newspapers, comic books, handbills, shopping news, and other similar items. In the years 1948 through 1966, newsprint consumption increased from 5.1 million tons to 9.2 million tons and per capita use from 70 pounds to 94 pounds (fig. 17; app. D, table 3).

Projections of per capita demand, based on the relationship between per capita use and per capita gross national product in the 1948–66 period (table 11), rise to 112 pounds in 1985 (table 10). This increase, when multiplied by the projected population (table 8), indicates a total demand for newsprint in 1985 of 14.3 million tons—some 1.6 times consumption in 1966 (table 9).

*Groundwood paper.*—Most of the groundwood paper, about nine-tenths of the total in 1964, is used in printing catalogs, directories, farm journals, paperbound books, and other similar items. A small quantity—hanging stock—is made into wallpaper. Nearly all of the remainder is used as converting paper in the manufacture of such products as office

[47] U.S. Department of Agriculture, Forest Service, p. 48.

[48] The regression equations, independent variables, units of measurement, and base time periods used as the base for the projections of demand for each grade of paper and board (tables 9 and 10) are shown in table 11. The regression coefficients, coefficients or indexes of correlation and determination, and related statistical measures are also shown in this table.

The projections shown in tables 9 and 10 were derived as follows: First, the mathematical projections obtained from the equations $Y = a + b\,X$ and $Y = a + b \log X$ (see table 11) were plotted on charts similar to those shown for each of the major grades of paper and board on following pages. Second, curves were fitted by eye to the historic trends (including preliminary 1966 data) and extended on a judgment basis through the projection period using the mathematical projections as the upper ($Y = a + b\,X$) and lower ($Y = a + b \log X$) limits. Thus, for most grades of paper and board the projections in tables 9 and 10 fall somewhere between the mathematical projections shown in table 11 and have the general form of the equation $Y = a + b \log X$.

The projections in the Timber Trends report were based on relationships in the 1947–62 period. In contrast, the years 1948 through 1966 were used as the time base for most of the projections in table 11. The slopes of the relationships between most grades of paper and board and the selected independent variables in this latter period are somewhat steeper, and the projections higher, than in the earlier period. This reflects the "tilt effect" of the rapid rise in consumption in the 1963–66 period on the slope of the relationships. For further discussion of this point see pages 19 and 20.

TABLE 11.—*Regression equations used*[1] *as the base for projections of demand for major grades of paper and board, dissolving and special alpha types of wood pulp, and imports of newsprint and sulfate wood pulp*

| Variable, time period, and regression equation | Regression coefficients | | Standard error of estimate[2] | Standard error of *b* coefficient[3] | Coefficient or index of correlation[4] | Coefficient or index of determination[5] | Degrees of freedom | F or *t* ratios[6] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | *a* | *b* | | | | | | | Total | Per Capita | Total | Per Capita | Total | Per Capita | Total | Per Capita |
| | | | | | | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| Per capita newsprint consumption as a function of per capita gross national product | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 35.8372 | 0.0155 | 0.4738 | 0.0016 | 0.921 | 0.848 | 17 | 9.7 | 9,774 | 94.89 | 11,274 | 102.49 | 13,026 | 110.39 | 15,142 | 118.76 |
| $Y = a + b \log X$[7] | −261.1466 | 98.8194 | .5129 | 11.1683 | .906 | .822 | 17 | 8.8 | 9,550 | 92.72 | 10,770 | 97.91 | 12,121 | 102.72 | 13,679 | 107.29 |
| Groundwood paper consumption as a function of industrial production | | | | | | | | | | | | | | | | |
| 1949–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 425.7133 | 4.3318 | 9.6263 | .4169 | .933 | .871 | 16 | 10.4 | 1,140 | 11.07 | 1,292 | 11.75 | 1,444 | 12.24 | 1,639 | 12.85 |
| $Y = a + b \log X$[7] | −1243.0791 | 1056.2210 | 8.9594 | 93.6918 | .942 | .888 | 16 | 11.3 | 1,099 | 10.67 | 1,187 | 10.79 | 1,261 | 10.69 | 1,342 | 10.53 |
| Uncoated book paper consumption as a function of gross national product | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 610.9107 | 2.4183 | 27.0949 | .2883 | .897 | .805 | 17 | 8.4 | 2,509 | 24.36 | 2,896 | 26.33 | 3,356 | 28.44 | 3,912 | 30.68 |
| $Y = a + b \log X$[7] | −5203.6851 | 2609.5610 | 30.5122 | 362.2641 | .868 | .753 | 17 | 7.2 | 2,351 | 22.82 | 2,561 | 23.28 | 2,769 | 23.47 | 2,978 | 23.36 |
| Per capita coated book paper consumption as a function of per capita disposable personal income | | | | | | | | | | | | | | | | |
| 1947–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −33.8146 | .0275 | .2414 | .0011 | .985 | .971 | 18 | 24.5 | 4,080 | 39.61 | 5,356 | 48.69 | 6,881 | 58.31 | 8,873 | 69.59 |
| $Y = a + b \log X$[7] | −381.4595 | 122.0649 | .2538 | 5.2415 | .984 | .968 | 18 | 23.3 | 3,790 | 36.80 | 4,727 | 42.97 | 5,761 | 48.82 | 7,006 | 54.95 |
| Per capita fine paper consumption as a function of per capita disposable personal income | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −12.8276 | .0164 | .1909 | .0009 | .974 | .949 | 17 | 17.8 | 3,189 | 30.96 | 4,001 | 36.37 | 4,969 | 42.11 | 6,227 | 48.84 |
| $Y = a + b \log X$[7] | −222.6375 | 73.5558 | .2043 | 4.4428 | .970 | .942 | 17 | 16.6 | 3,028 | 29.40 | 3,643 | 33.12 | 4,325 | 36.65 | 5,143 | 40.34 |

See footnotes at end of table.

TABLE 11.—*Regression equations used*[1] *as the base for projections of demand for major grades of paper and board, dissolving and special alpha types of wood pulp, and imports of newsprint and sulfate wood pulp*—Continued

| Variable, time period, and regression equation | Regression coefficients | | Standard error of estimate[2] | Standard error of *b* coefficient[3] | Coefficient or index of correlation[4] | Coefficient or index of determination[5] | Degrees of freedom | *F* or *t* ratios[6] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | *a* | *b* | | | | | | | Total | Per Capita | Total | Per Capita | Total | Per Capita | Total | Per Capita |
| | | | | | | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| Per capita coarse and industrial paper consumption as a function of per capita gross national product | | | | | | | | | | | | | | | | |
| 1947–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 21.4194 | 0.0106 | 0.4604 | 0.0015 | 0.861 | 0.741 | 18 | 7.2 | 6,366 | 61.81 | 7,370 | 67.00 | 8,544 | 72.41 | 9,962 | 78.13 |
| $Y = a + b \log X$[7] | −184.4647 | 68.3841 | .4461 | 9.1317 | .870 | .757 | 18 | 7.5 | 6,222 | 60.41 | 7,041 | 64.01 | 7,946 | 67.34 | 8,989 | 70.50 |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | | | | | | | | | | | | | | | | |
| 1947–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −16.9924 | .0205 | .1872 | .0009 | .984 | .969 | 18 | 23.6 | 3,887 | 37.74 | 4,896 | 44.51 | 6,098 | 51.68 | 7,661 | 60.09 |
| $Y = a + b \log X$[7] | −278.4015 | 91.7094 | .1624 | 3.3540 | .988 | .976 | 18 | 27.3 | 3,692 | 35.84 | 4,453 | 40.48 | 5,296 | 44.88 | 6,309 | 49.48 |
| Per capita container board consumption as a function of per capita disposable personal income | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −60.9487 | .0787 | .6956 | .0034 | .985 | .970 | 17 | 23.4 | 15,366 | 149.18 | 19,267 | 175.15 | 23,919 | 202.70 | 29,957 | 234.96 |
| $Y = a + b \log X$[7] | −1067.3910 | 352.7988 | .7618 | 16.5648 | .982 | .964 | 17 | 21.3 | 14,572 | 141.48 | 17,526 | 159.33 | 20,796 | 176.24 | 24,726 | 193.93 |
| Folding boxboard consumption as a function of gross national product | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 763.7453 | 4.3785 | 30.8033 | .3278 | .956 | .913 | 17 | 13.4 | 4,201 | 40.79 | 4,901 | 44.55 | 5,733 | 48.58 | 6,740 | 52.86 |
| $Y = a + b \log X$[7] | −10354.6699 | 4945.5598 | 26.5213 | 314.8802 | .967 | .936 | 17 | 15.7 | 3,962 | 38.47 | 4,360 | 39.64 | 4,754 | 40.29 | 5,150 | 40.39 |
| Per capita special food board consumption as a function of per capita disposable personal income | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −26.6471 | .0215 | .2740 | .0013 | .969 | .939 | 17 | 16.2 | 3,168 | 30.76 | 4,164 | 37.85 | 5,355 | 45.38 | 6,909 | 54.19 |
| $Y = a + b \log X$[7] | −305.8789 | 97.6753 | .2213 | 4.8111 | .980 | .960 | 17 | 20.3 | 2,967 | 28.81 | 3,712 | 33.75 | 4,535 | 38.43 | 5,525 | 43.33 |

See footnotes at end of table.

**TABLE 11.**—*Regression equations used [1] as the base for projections of demand for major grades of paper and board, dissolving and special alpha types of wood pulp, and imports of newsprint and sulfate wood pulp*—Continued

| Variable, time period, and regression equation | Regression coefficients | | Standard error of estimate [2] | Standard error of *b* coefficient [3] | Coefficient or index of correlation [4] | Coefficient or index of determination [5] | Degrees of freedom | *F* or *t* ratios [6] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | *a* | *b* | | | | | | | Total | Per Capita | Total | Per Capita | Total | Per Capita | Total | Per Capita |
| | | | | | | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| Insulating board consumption as a function of gross national product | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 290.4455 | 1.5317 | 17.5090 | 0.1863 | 0.894 | 0.799 | 17 | 82.2 | 1,493 | 14.50 | 1,738 | 15.80 | 2,029 | 17.19 | 2,381 | 18.67 |
| $Y = a + b \log X$ [7] | −3633.7512 | 1743.0401 | 16.0520 | 190.5819 | .912 | .831 | 17 | 9.1 | 1,412 | 13.71 | 1,553 | 14.12 | 1,691 | 14.33 | 1,831 | 14.36 |
| Per capita hardboard consumption as a function of per capita disposable personal income | | | | | | | | | | | | | | | | |
| 1947–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −17.0408 | .0131 | .1764 | .0008 | .967 | .934 | 18 | 16.0 | 1,848 | 17.94 | 2,449 | 22.26 | 3,167 | 26.84 | 4,108 | 32.22 |
| $Y = a + b \log X$ [7] | −183.0463 | 58.2714 | .1757 | 3.6271 | .967 | .935 | 18 | 16.1 | 1,712 | 16.62 | 2,153 | 19.57 | 2,638 | 22.36 | 3,223 | 25.28 |
| Other board consumption as a function of gross national product | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 571.3646 | 3.8755 | 26.3235 | .2801 | .958 | .918 | 17 | 13.8 | 3,614 | 35.09 | 4,234 | 38.49 | 4,970 | 42.12 | 5,861 | 45.97 |
| $Y = a + b \log X$ [7] | −9081.8319 | 4307.1680 | 27.4773 | 326.2316 | .955 | .911 | 17 | 13.2 | 3,387 | 32.88 | 3,734 | 33.95 | 4,077 | 34.55 | 4,422 | 34.68 |
| Newsprint imports as a function of newsprint consumption | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | 1610.4326 | .5435 | 43.2015 | .0424 | .952 | .906 | 17 | 12.8 | 6,882 | 66.82 | 7,589 | 68.99 | 8,404 | 71.22 | 9,382 | 73.58 |
| $Y = a + b \log X$ [7] | −27291.8284 | 8516.1021 | 50.0015 | 783.2201 | .935 | .874 | 17 | 10.9 | 6,660 | 64.66 | 7,125 | 64.77 | 7,598 | 64.39 | 8,095 | 63.49 |
| Dissolving and special alpha types of wood pulp consumption as a function of gross national product | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −24.7929 | 1.9801 | 13.2775 | .1413 | .959 | .920 | 17 | 14.0 | 1,530 | 14.85 | 1,846 | 16.78 | 2,223 | 18.84 | 2,678 | 21.00 |
| $Y = a + b \log X$ [7] | −5024.0394 | 2225.7540 | 12.0890 | 143.5295 | .966 | .934 | 17 | 15.5 | 1,419 | 13.78 | 1,599 | 14.54 | 1,776 | 15.05 | 1,954 | 15.33 |

See footnotes at end of table.

TABLE 11.—*Regression equations used*[1] *as the base for projections of demand for major grades of paper and board, dissolving and special alpha types of wood pulp, and imports of newsprint and sulfate wood pulp*—Continued

| Variable, time period, and regression equation | Regression coefficients | | Standard error of estimate[2] | Standard error of *b* coefficient[3] | Coefficient or index of correlation[4] | Coefficient or index of determination[5] | Degrees of freedom | F or t ratios[6] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | *a* | *b* | | | | | | | Total | Per Capita | Total | Per Capita | Total | Per Capita | Total | Per Capita |
| | | | | | | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| Sulfate wood pulp imports as a function of paper and board production in the U.S. | | | | | | | | | | | | | | | | |
| 1948–66 | | | | | | | | | | | | | | | | |
| $Y = a + b X$ | −500.5046 | .0516 | 17.7771 | 0.0024 | 0.982 | 0.964 | 17 | 21.3 | 2,343 | 22.75 | 2,946 | 26.78 | 3,684 | 31.22 | 4,525 | 35.49 |
| $Y = a + b \log X$[7] | −15548.2990 | 3716.4017 | 25.5610 | 256.0556 | .962 | .925 | 17 | 14.5 | 2,072 | 20.12 | 2,383 | 21.66 | 2,696 | 22.85 | 2,991 | 23.46 |

[1] The form of the regression equations, independent variables, units of measure, and base time period shown in this table were selected from a series of equations which were tested to determine which would be the best for making longrun projections of demand for paper and board (see part one of this report and app. B).

[2] A measure of the closeness with which values of a dependent variable can be estimated from the values of an independent variable.

[3] A measure of the closeness with which the true values of the regression coefficients can be estimated from the values in the sample.

[4] A measure of the degree of relationship between the dependent and independent variables.

[5] A measure of the percent of variation in the values of the dependent variable that is associated with variation in values of the independent variable.

[6] A measure of the probability that the given values of *b* might have been obtained by chance from a population in which the true regression coefficient is zero.

[7] Expressed in common logarithms.

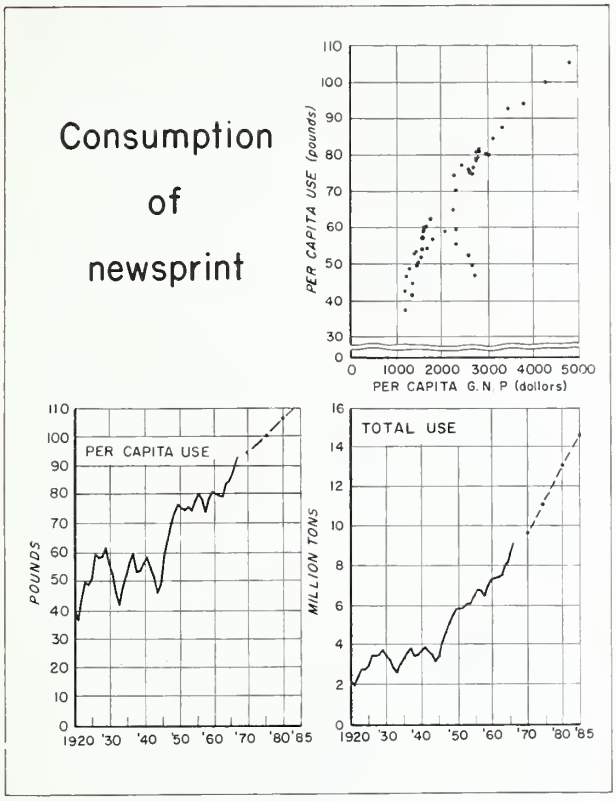


FIGURE 17.

forms, waybills, salesbooks, and small roll products used in office machines.

Consumption of groundwood paper in all uses increased from 0.7 million tons in 1949 to 1.1 million tons in 1966 (fig. 18; app. D, table 4). Per capita use did not show much change, averaging about 10 pounds a year in this period. Because of this lack of trend, there was no correlation between per capita use and per capita gross national product or per capita disposable personal income in the 1949–66 period. There was, however, a fairly close relationship between changes in total consumption and changes in industrial production (table 11). Chiefly on the basis of this relationship, demand was projected to 1.5 million tons in 1985—an increase of 36 percent over 1966 (table 9). With this level of total demand and the projected population, per capita use would average about 12 pounds, which is not significantly different from the average of recent years (table 10).

*Book paper.*—Book paper includes "coated book paper" and "uncoated book paper." Both kinds are used in printing magazines, books, pamphlets, folders, and brochures, with the coated paper being used where fine halftone illustrations are desired.

In the years 1947 through 1966, consumption of coated book paper increased from 0.6 million tons to 3.0 million tons and per capita use from 9 pounds to 30 pounds (fig. 19; app. D, table 5).

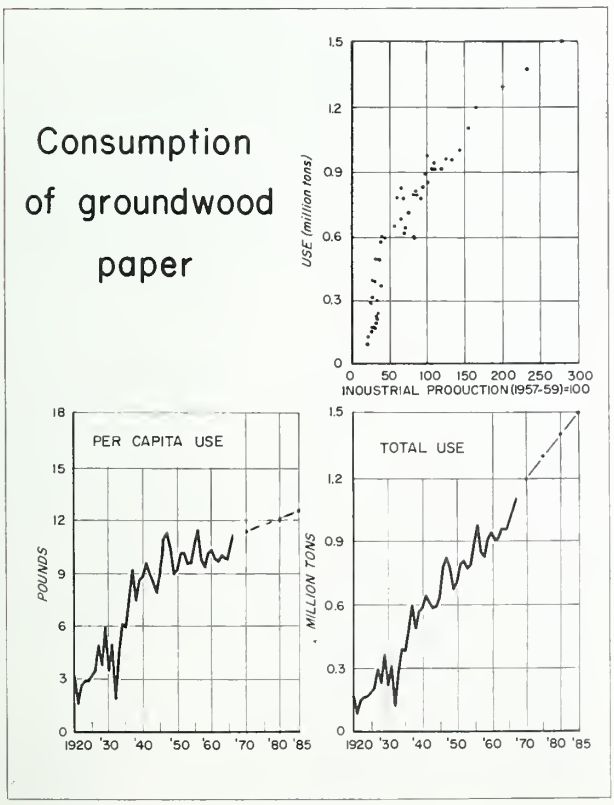


FIGURE 18.

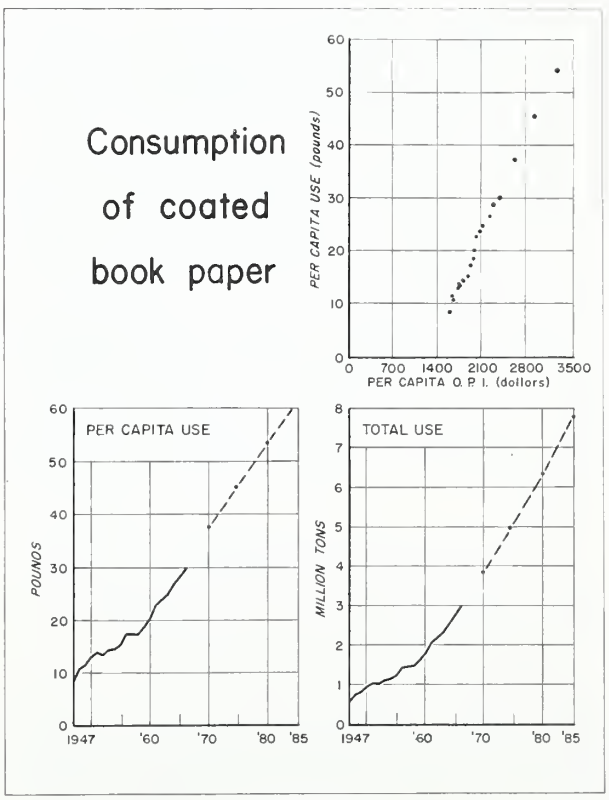


FIGURE 19.

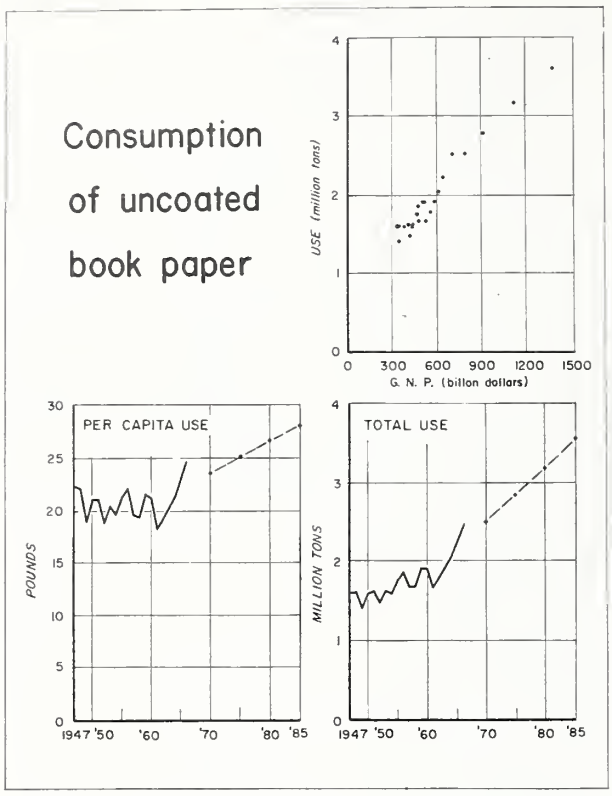


FIGURE 20.

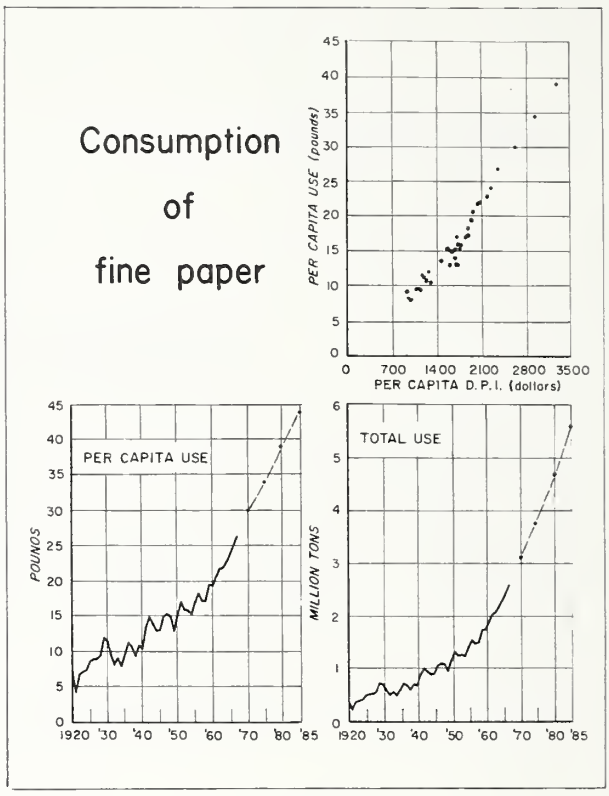


FIGURE 21.

Consumption of uncoated book paper rose at a much slower rate, with total use increasing from 1.6 million tons to 2.5 million tons (fig. 20; app. D, table 5). Per capita use showed no trend, averaging about 21 pounds per year.

There was a close relationship between changes in per capita coated book paper consumption and changes in per capita disposable personal income in the 1947–66 period. Projections of per capita demand based on this relationship rise to 61 pounds in 1985 (table 10). The associated total demand is 7.8 million tons (table 9). Projected demand for uncoated book paper, based largely on the relationship between total consumption in the 1948–66 period and gross national product, amounts to 3.6 million tons in 1985 (table 9). Given this level of total demand, per capita use averages 28 pounds.

The total projected demand for book paper (coated and uncoated) amounts to 11.4 million tons in 1985—some 2.1 times consumption in 1966 (table 9). Per capita use rises from 56 pounds to 89 pounds (table 10).

*Fine paper.*—Fine paper includes a variety of writing papers; cover, text, and thin papers; and bristols—a type of cardboard used for postcards and various other kinds of index and printed cards. The writing papers are presently the most important grades, composing more than three-fourths of all the fine papers used.

In the years 1948 through 1966, consumption of fine paper rose from 1.1 million tons to 2.6 million tons and per capita use from 15 pounds to 26 pounds (fig. 21; app. D, table 6). In this period, the changes in per capita consumption were closely related to changes in per capita disposable personal income. Projections of per capita demand derived from this relationship rise to 44 pounds in 1985. The associated total demand is 5.6 million tons—about 2.2 times use in 1966.

*Coarse and industrial paper.*—Coarse and industrial paper includes bag paper; shipping sack paper; wrapping paper; converting papers such as asphalting paper, envelope stock, gumming stock, and waxing stock; glassine and greaseproof paper; and special industrial papers such as tabulating card stock, tag stock, and resin-impregnated stock. In 1964 the bag, shipping sack, and wrapping papers composed nearly three-fifths of the coarse and industrial paper consumed. Converting and special industrial paper accounted for most of the remaining two-fifths.

Consumption of all grades of coarse and industrial paper increased from 3.3 million tons in 1947 to 5.6 million tons in 1966 (fig. 22; app. D, table 7). Per capita use rose from 45 pounds to 57 pounds. Projections, based on the rela-

tionship between per capita use and per capita gross national product in the 1947–66 period, indicate a per capita demand in 1985 of about 77 pounds. With this level of per capita use, total demand would be 9.8 million tons—1.8 2.4 times use in 1966.

*Sanitary and tissue paper.*—Sanitary and tissue paper includes such items as toilet tissue stock, toweling stock, facial tissue stock, napkin stock, and tissue paper. Toweling and toilet tissue are the important grades in terms of volume, composing about two-thirds of total use in recent years.

Consumption of all grades in 1966 was 3.0 million tons—about 2.7 times the 1.1 million tons used in 1947 (fig. 23; app. D, table 8). Per capita use doubled in this period, rising from 15 pounds to 30 pounds. Projected per capita use, derived from the relationship between per capita disposable personal income in the 1947–66 period, rises to 56 pounds in 1985. The associated total demand is 7.1 million tons—some 2.4 times use in 1966.

*Construction paper* (*building paper*).—Construction paper is the term applied to a class of strong, heavy papers used in buildings as a covering for sheathing and underflooring; and in manufacturing for conversion to such products as roofing, sheathing, and tarred or asphalt-coated vapor barriers. Some construction paper is also used in the manufacture of rock wool, mineral wool, and fiberglass insulation batts.

Consumption of construction paper, largely in the form of roofing felts used as the base in the manufacture of roofing papers, increased from 1.3 million tons in 1948 to a peak of 1.6 million tons in 1955 (fig. 24; app. D, table 9). Since then, consumption has averaged about 1.4 million tons a year. Per capita use fluctuated around 18 pounds in the early 1950's but subsequently declined to 15 pounds in 1966.

The relationship between the changes in consumption of construction paper and changes in housing starts, construction expenditures, population, and all of the other independent variables tested was not close enough in the 1948–66 period to justify the use of regression equations in making a projection of demand. Largely on the basis of recent trends in use and expectations concerning future levels of residential construction, it was assumed that total demand will rise slowly, reaching a level of about 2.0 million tons a year by 1985. With this level of consumption, per capita use would remain at about 16 pounds.

*Container board.*—Container board includes liners (the material used as a facing on corrugated or solid fiberboard), corrugating material (the material used as the fluted member in making corrugated board), and container chip-

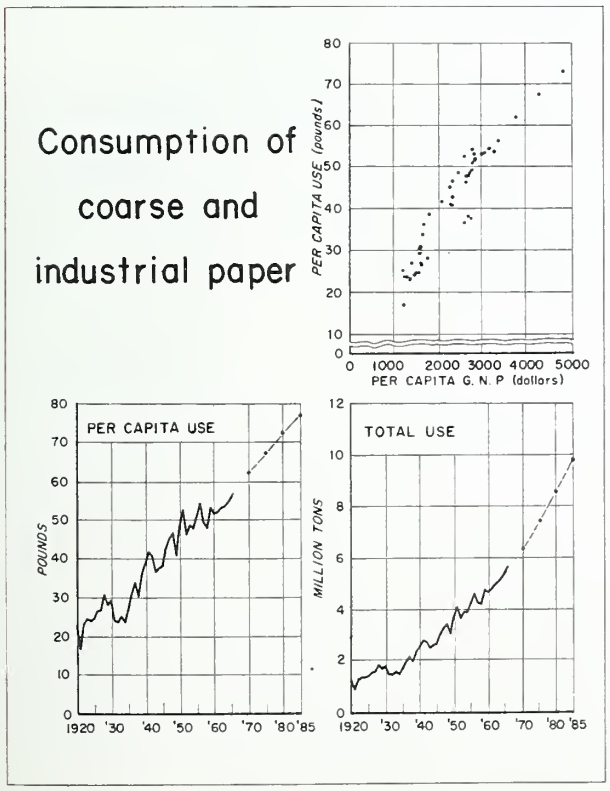


FIGURE 22.

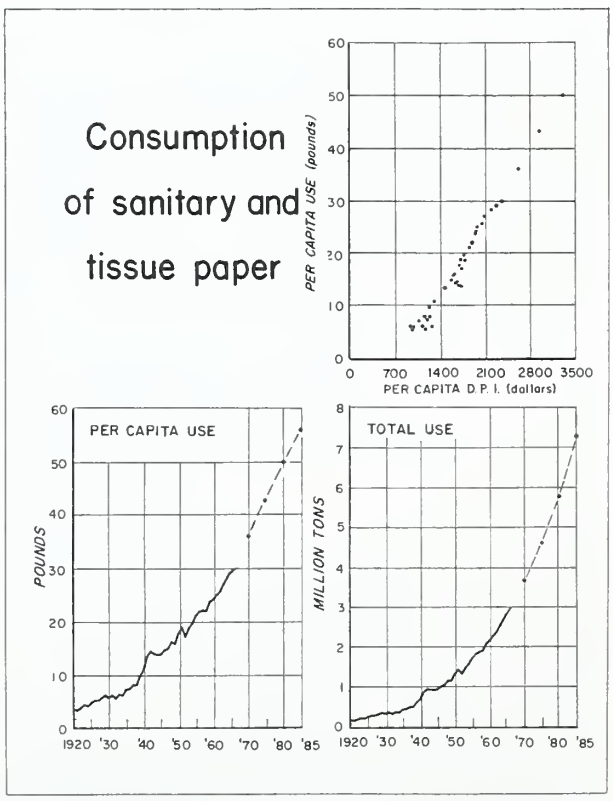


FIGURE 23.

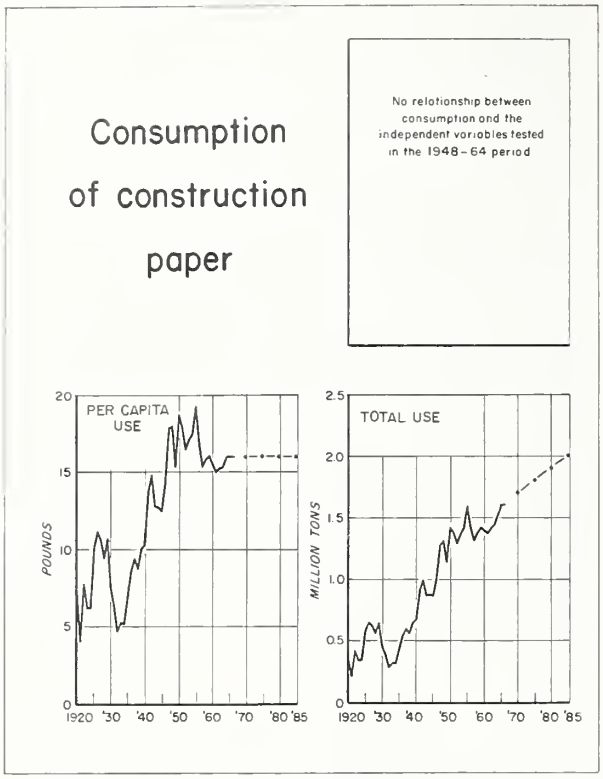


FIGURE 24.

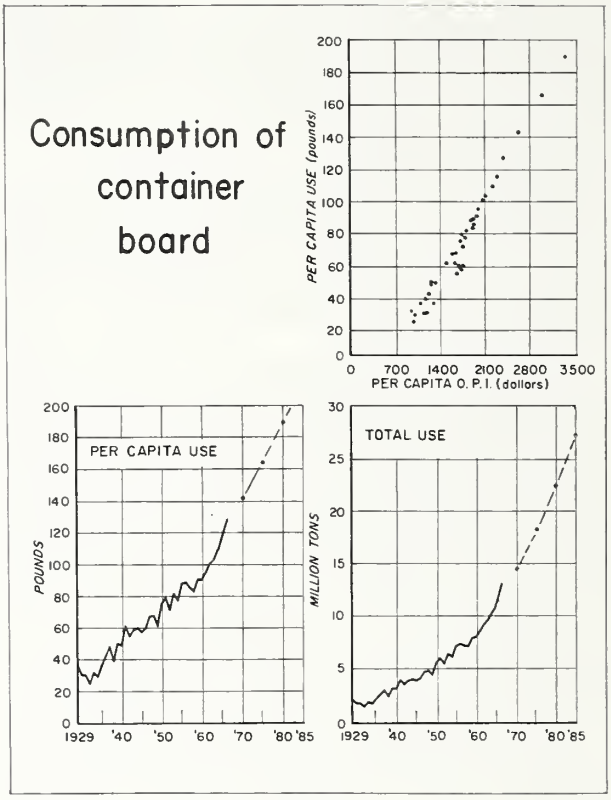


FIGURE 25.

board. In the recent past, liners have composed about two-thirds of the container board used, and corrugating material nearly all of the remainder.

Consumption of container board in 1966 was 12.6 million tons—some 2.5 times the 5.0 million tons consumed in 1948 (fig. 25; app. D, table 11). Per capita use in this base period increased 1.9 times, rising from 68 pounds to 128 pounds.

On the basis of the relationship between per capita container board consumption and per capita disposable personal income in the years 1948 through 1966, per capita demand is projected to rise to 215 pounds in 1985. Total demand in 1985 is 27.4 million tons—about 2.2 times use in 1966.

*Bending board.*—Bending board includes "folding boxboard" used in the manufacture of collapsible or folding cartons for packaging such items as cereal, toothpaste, and cigarettes; and "special food board" used in packaging goods such as milk and frozen foods, and as containers for hot and cold drinks.

Consumption of folding boxboard rose from 2.2 million tons in 1948 to 3.5 million tons in 1966 and per capita use from 30 to 36 pounds (fig. 26; app. D, table 12). The consumption of special food board increased 5½ times—from 0.4 million tons to 2.2 million tons—and per

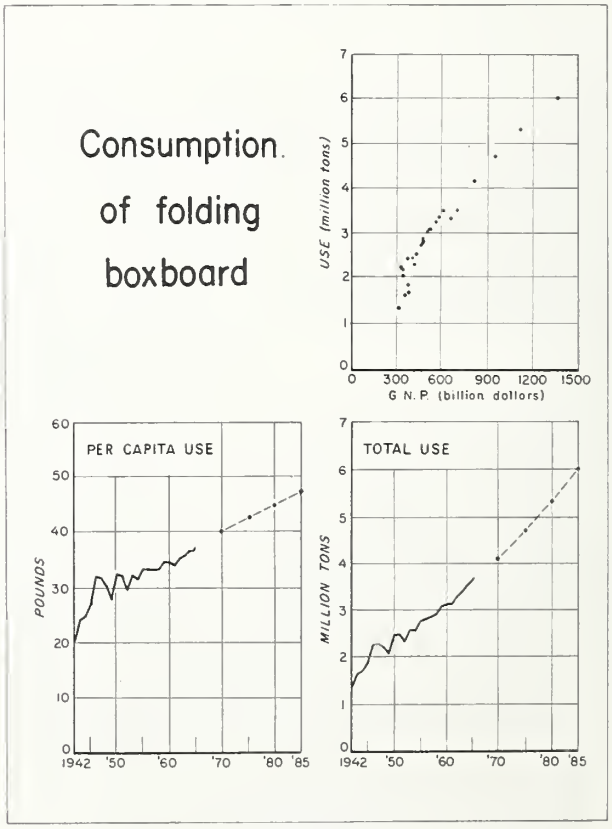


FIGURE 26.

capita use nearly quadrupled, rising from 6 pounds to 22 pounds (fig. 27; app. D, table 12).

On the basis of the relationship between aggregate consumption of folding boxboard and gross national product in the 1948–66 period, demand is projected to 6.0 million tons in 1985. The per capita use associated with this volume is 47 pounds. Projected per capita demand for special food board, based on the relationship between per capita consumption and per capita disposable personal income, rises to 44 pounds in 1985 and aggregate demand to 5.6 million tons.

The total projected demand for bending board (including folding boxboard and special food board) in 1985 is 11.6 million tons, and per capita demand 91 pounds. These volumes are respectively 2.0 times and 1.6 times the 1966 levels.

*Building board.*—Building board includes "insulating board," used largely for sheathing in residential construction, and "hardboard," chiefly used in the manufacture of furniture, fixtures, paneling, mobile homes, and millwork; and as floor underlayment in residential construction.

In the years 1948 through 1966, consumption of insulating board increased from 0.9 million tons to 1.2 million tons while per capita use

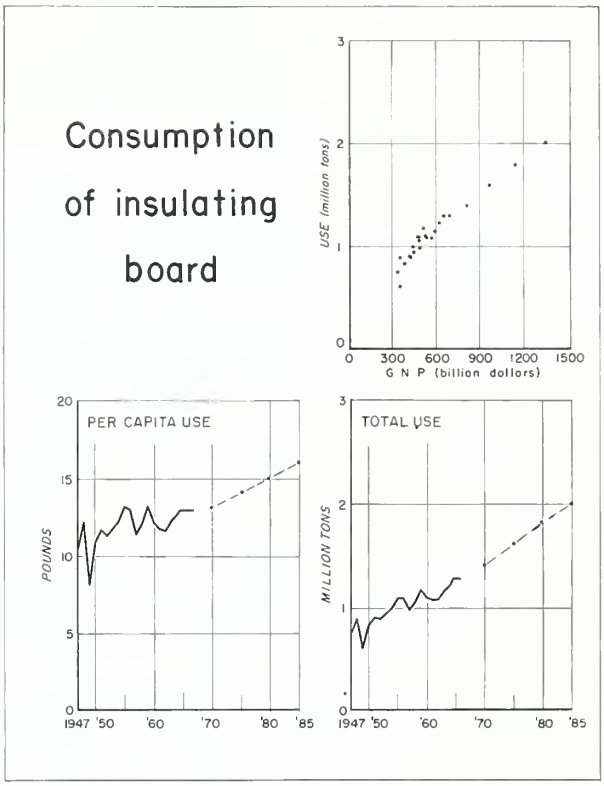


FIGURE 28.

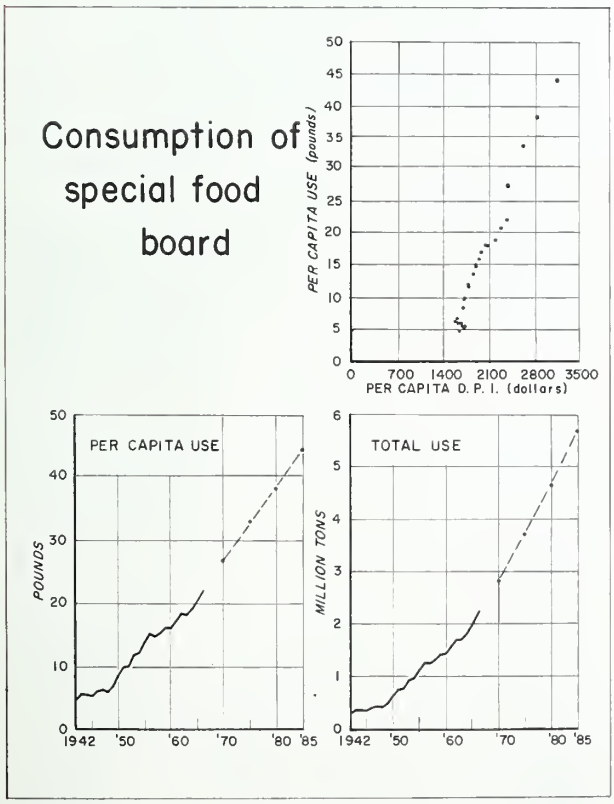


FIGURE 27.

fluctuated between 11 and 13 pounds (fig. 28; app. D, table 13). Total and per capita hardboard use rose from 0.4 million tons to 1.2 million tons and from 5 pounds to 12 pounds, respectively (fig. 29; app. D, table 13).

Projected demand for insulating board, based on the relationship between total use and gross national product in the 1948–66 years, rises to 2.0 million tons in 1985. The associated per capita demand is 16 pounds. Projected per capita demand for hardboard in 1985, based on the relationship between per capita use and per capita disposable personal income in the 1947–66 period, rises to 28 pounds and total demand to 3.6 million tons.

Total demand for building board in 1985 amounts to 5.6 million tons—some 2.3 times consumption in 1966. Per capita demand rises from 24 to 44 pounds.

*Other board.*—Other board includes building board stock; setup boxboard; tube, can, and drum stock; cardboard; other special grades of paperboard; and wet machine board. About a quarter of the other board consumed is used as liner for gypsum plasterboard. Another 10 percent or so is used for such things as binding books, and in the manufacture of playing cards, posters, postcards, and shoes. Most of the remainder is consumed in the manufacture of rigid containers such as hat boxes, shoe boxes, and filing boxes.

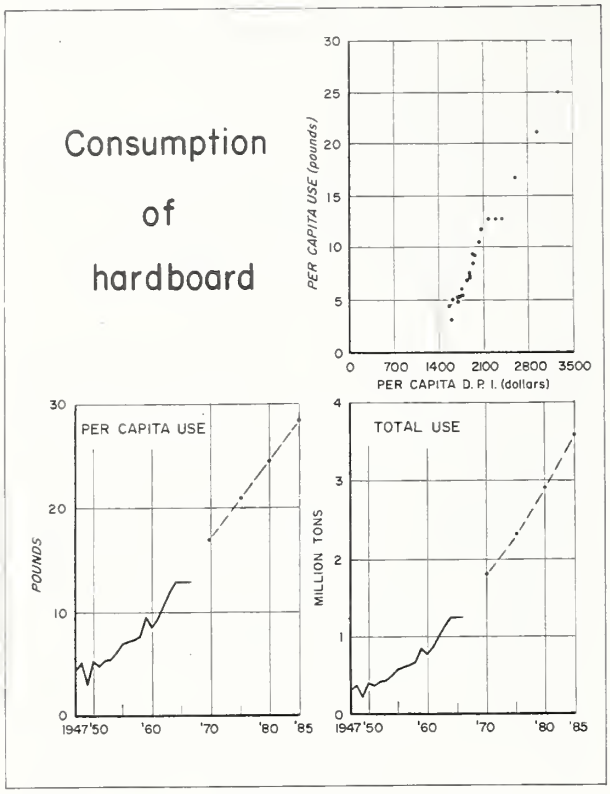


FIGURE 29

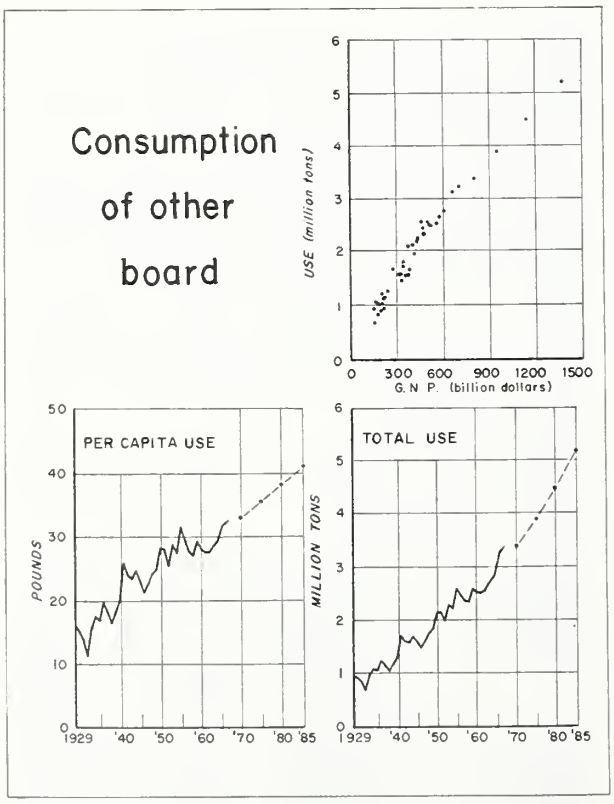


FIGURE 30.

Consumption of other board in all uses rose from 1.8 million tons in 1948 to 3.3 million tons in 1966 (fig. 30; app. D, table 14). Per capita use increased rapidly in the late 1940's and early 1950's, but since 1955 has averaged from 30 to 33 pounds.

Projected demand for other board, derived from the relationship between total use and gross national product in the years 1948 through 1966, rises to 5.2 million tons in 1985, about 1.6 times that of 1966. Per capita use increases to about 41 pounds.

### *Projections of demand for paper and board sensitive to changes in population and income*

The projections of demand in tables 9 and 10 are based on what, at this time, appear to be the most reasonable assumptions concerning growth in population and economic activity. However, past experience has indicated that actual growth in these determinants is likely to deviate significantly from assumed levels. Because of this uncertainty, a series of alternative projections of demand for paper and board, based on different assumptions of population and economic growth, are presented in table 12.

These alternatives are based on assumed levels of population and economic activity which bracket the ranges in which the actual future values seem likely to fall. Thus, they give some indication of the band of uncertainty around the projections of demand for paper and board shown in table 9. They also illustrate the sensitivity of these projections to population and economic growth.

It is apparent that the range in projections of demand for paper and board, resulting from different but reasonable asumptions concerning population and the gross national product, are large. If, for example, the gross national product increases at a rate of 3.25 percent per year, instead of the 3.75 percent assumed in this study, the demand for paper and board in 1985 would be about 10 percent below that shown in table 9. If it grows by 4.25 percent per year, a rate well within the range of possibilities, demand in 1985 would be about 10 percent above that projected in table 9.

The above alternatives illustrate the dependency of projections, such as those in tables 9 and 10, on the underlying assumptions. The projections in these tables should be considered as only one carefully worked out indication of possible changes in demand. Other patterns of change may be equally probable.

TABLE 12.—*Projected demand for paper and board based on alternative assumptions concerning the future levels of population and economic activity*

| Year | Projections based on alternative assumptions on growth in population | | | | | | Projections based on alternative assumptions on growth in economic activity | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | | Medium [1] | | High | | Low | | Medium [1] | | High | |
| | Population [2] | Demand for paper and board [3] | Population | Demand for paper and board | Population [4] | Demand for paper and board [5] | Gross national product [6] (1961 prices) | Demand for paper and board [7] | Gross national product (1961 prices) | Demand for paper and board | Gross national product [8] (1961 prices) | Demand for paper and board [9] |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| | *Millions* | *Million tons* | *Millions* | *Million tons* | *Millions* | *Million tons* | *Billion dollars* | *Million tons* | *Billion dollars* | *Million tons* | *Billion dollars* | *Million tons* |
| 1970 | 204.1 | 59.6 | 206 | 60.3 | 208.9 | 61.0 | 770 | 58.9 | 785 | 60.3 | 800 | 61.4 |
| 1975 | 214.1 | 70.0 | 220 | 72.1 | 227.5 | 74.4 | 905 | 68.5 | 945 | 72.1 | 985 | 75.6 |
| 1980 | 226.0 | 82.3 | 236 | 85.9 | 249.4 | 90.8 | 1,060 | 79.1 | 1,135 | 85.9 | 1,215 | 92.2 |
| 1985 | 239.8 | 95.6 | 255 | 101.5 | 273.3 | 108.9 | 1,245 | 90.9 | 1,365 | 101.5 | 1,495 | 111.4 |

[1] The projections under the column headings are the same as those shown in tables 8 and 9.

[2] The lowest projection of population (Series D) in the Bureau of the Census report *Revised projections of the population of the United States by age and sex to 1985.*

[3] Derived by multiplying the projected per capita demands for paper and board shown in table 10 by the population in column 1. The use of the projections of per capita demand shown in table 10 implicitly assumes that the relationships between population and the various measures of economic activity will be the same as shown in table 8. Among other things this means that per capita gross national product and per capita disposable personal income shown in table 8 would be the same.

[4] The highest projections of population (Series A), Ibid.

[5] Derived by multiplying the projected per capita demands for paper and board shown in table 10 by the population shown in column 5. The use of the projections of per capita demand shown in table 10 implicitly assumes that the relationships between population and the various measures of economic activity will be the same as shown in table 8. Among other things this means that per capita gross national product and per capita disposable personal income shown in table 8 would be the same.

[6] Based on the assumption that the estimated gross national product in 1966 will increase at an annual rate of 3.25 percent.

[7] Based on the gross national product projections shown in column 7, the population projections shown in column 3 and the assumption that the relationships between the gross national product shown in column 7 and other measures of economic activity will be the same as those shown in table 8.

[8] Based on the assumption that the estimated gross national product in 1966 will increase at an annual rate of 4.25 percent.

[9] Based on the gross national product projections shown in column 11, the population projections shown in column 3, and the assumption that the relationships between the gross national product shown in column 11 and the other measures of economic activity will be the same as those shown in table 8.

## Projected Imports and Exports of Paper and Board

The United States carries on an extensive trade in paper and board with many countries of the world. In 1966 imports amounted to 7.5 million tons and exports 1.8 million tons (table 13). Net imports of 5.8 million tons composed about 11 percent of the paper and board consumed.

### *Imports expected to continue to rise rapidly but not as fast as domestic consumption*

In the years 1948 through 1966 imports of paper and board increased from 4.6 to 7.5 million tons in a continuation of a trend that has been rising fairly rapidly since the early 1900's (fig. 31; app. D, table 17). Newsprint composed 90 percent or more of total imports for several decades although in recent years some other grades, especially building board, have been increasing in importance. Canada, which in 1964 was the origin of about 92 percent of total paper and board imports and 96 percent of the newsprint imports, has been the chief source of supply (app. D, table 18).

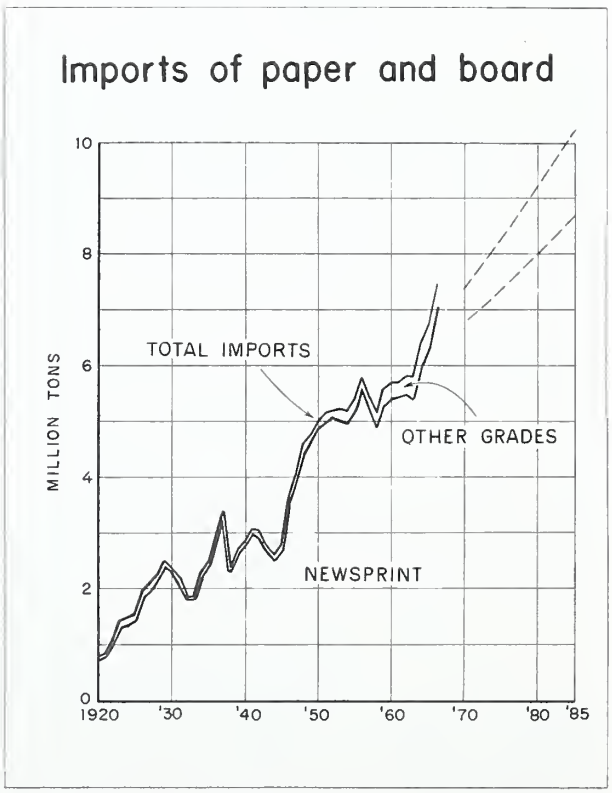


FIGURE 31.

TABLE 13.—*Apparent consumption, trade, and production of paper and board, 1920–85* [1]
[Million tons]

| Year | Consumption | Trade | | | | | U.S. production |
|---|---|---|---|---|---|---|---|
| | | Imports | | | Exports | Net imports | |
| | | Total | Newsprint | Other | | | |
| 1920 | 7.7 | 0.8 | 0.7 | ([2]) | 0.2 | 0.6 | 7.2 |
| 1925 | 10.4 | 1.5 | 1.4 | 0.1 | .1 | 1.4 | 9.0 |
| 1930 | 12.3 | 2.3 | 2.3 | ([2]) | .2 | 2.2 | 10.2 |
| 1935 | 12.8 | 2.4 | 2.4 | .1 | .1 | 2.3 | 10.5 |
| 1940 | 16.8 | 2.8 | 2.8 | ([2]) | .5 | 2.3 | 14.5 |
| 1945 | 19.8 | 2.8 | 2.7 | .1 | .4 | 2.4 | 17.4 |
| 1950 | 29.1 | 5.0 | 4.9 | .1 | .3 | 4.7 | 24.4 |
| 1955 | 35.0 | 5.5 | 5.2 | .3 | .7 | 4.7 | 30.2 |
| 1960 | 39.3 | 5.7 | 5.5 | .3 | .9 | 4.8 | 34.4 |
| 1961 | 40.5 | 5.8 | 5.5 | .3 | 1.0 | 4.7 | 35.7 |
| 1962 | 42.3 | 5.8 | 5.5 | .3 | 1.0 | 4.8 | 37.5 |
| 1963 | 43.9 | 5.8 | 5.4 | .4 | 1.1 | 4.6 | 39.2 |
| 1964 | 46.6 | 6.4 | 6.0 | .4 | 1.5 | 4.9 | 41.7 |
| 1965[3] | 48.9 | 6.8 | 6.3 | .4 | 1.6 | 5.1 | 43.8 |
| 1966[3] | 52.4 | 7.5 | 7.0 | .5 | 1.8 | 5.8 | 46.7 |
| PROJECTIONS | | | | | | | |
| 1970 | 60.3 | 7.4 | 6.8 | .6 | 2.2 | 5.2 | 55.1 |
| 1975 | 72.1 | 8.3 | 7.4 | .9 | 3.0 | 5.3 | 66.8 |
| 1980 | 85.9 | 9.2 | 8.0 | 1.2 | 4.4 | 4.8 | 81.1 |
| 1985 | 101.5 | 10.3 | 8.7 | 1.6 | 6.2 | 4.1 | 97.4 |

[1] Data may not add to totals because of roundings.
[2] Less than 50 thousand tons.
[3] Preliminary.
NOTE: Annual data on production, trade, and consumption are shown in the tables in appendix D.
Sources: See source note, table 9.

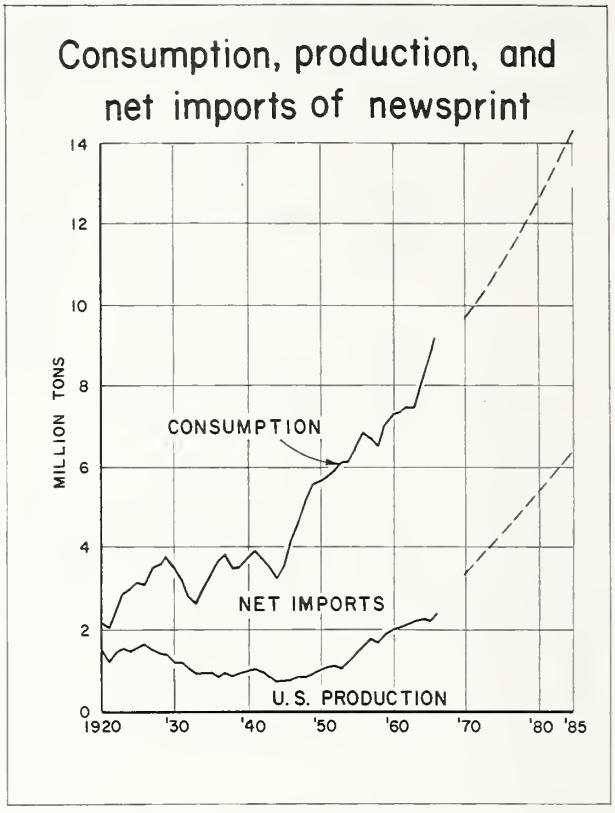


FIGURE 32.

In the late 1940's, imports composed more than four-fifths of the newsprint used in the U.S. (fig. 32; app. D, table 3). Since then, imports have slowly declined in relative importance and in 1966 accounted for 76 percent of the newsprint consumed. This decline largely reflects the development of a domestic newsprint industry in the South.

Despite the decline there was a close relationship between newsprint consumption and imports in the 1948–66 period (table 11). Projected newsprint imports, based on this relationship, rise to 8.7 million tons in 1985—some 24 percent above 1966 (table 13). Canada is expected to be the source of nearly all of these imports.

Given this level of imports, domestic mills will supply an increasing proportion of the country's newsprint needs—with output rising from 2.3 million tons in 1966 to 5.8 million tons in 1985. Most of the growth in the domestic industry is likely to be in the South and West.

On the basis of the extrapolation of freehand curves fitted to the historical data (made with consideration of the projected increases in domestic demands for paper and board) it is estimated that imports of grades of paper and board other than newsprint will total 1.6 million tons in 1985 (table 13). When these imports are added to the projected newsprint imports, it appears that total imports of paper and board in 1985 will be 10.3 million tons, some 37 percent above 1966.

### *Exports of paper and board have increased fivefold since 1948—expected to continue to rise in proportion to growth in world demands*

In the years 1948 through 1966, exports of paper and board increased sixfold, rising from 0.3 million tons to 1.8 million tons (table 13; fig. 33). Nearly all grades of paper and board showed some increase, although most of the growth, especially since the mid-1950's, has been in container board (mostly liners) (app. D, table 19).

Exports of paper and board have moved to all regions of the world (app. D, table 20). However, in 1964 about 42 percent of the total went to Western Europe [49] and most of the remainder to Latin America, the Far East, and Canada. The level of exports to Canada, about 144 thousand tons in 1964, has not changed much in recent years, and nearly all of the recent growth in shipments has been to Western Europe and Latin America.

[49] For definition of world regions see note to table 18, appendix D.

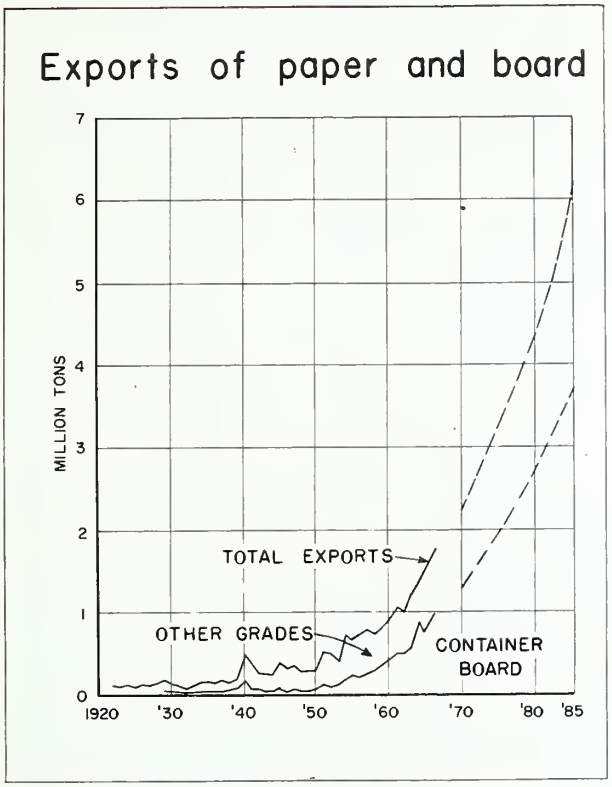


FIGURE 33.

Recent studies of the Food and Agriculture Organization of the United Nations indicate that there is likely to be a substantial rise in the world demand for paper and board (see tabulation below).

| Region | Projections of demand for paper and board | | |
|---|---|---|---|
| | 1965 | 1970 | 1975 |
| | (Million short tons) | | |
| Western Europe [1] | 26.4 | 33.2 | 40.6 |
| Latin America [2] | 3.8 | -- | 7.2 |
| Far East [2] | 7.6 | -- | 15.2 |
| All other (except North America) [2] | 17.2 | -- | 35.5 |

[1] United Nations Food and Agriculture Organization. *Pulp and paper prospects in Western Europe*, p. 76.
[2] United Nations Food and Agriculture Organization. *World demand for paper to 1975*, p. 51.

There are many factors, such as the location and extent of forest resources, especially the long-fibered softwood species; the comparative cost and availability of labor, pulpwood, wood pulp, and other raw materials; the location and amount of paper and board mill capacity; tariffs, including the internal tariffs in organizations like the European Free Trade Association and the Common Market; and the trade and economic policies of countries like the U.S.S.R., which will determine how these prospective demands will be supplied. These factors have been discussed in a general way in many of the recent studies of prospective world demands for paper and board [50] and of U.S. export markets.[51] Most of this discussion was speculative because there are not enough quantitative data available to adequately appraise the effects of many of the important determinants on future trade, especially for individual countries.

In the absence of more definitive information, it seems reasonable to expect that U.S. exports will at least be able to maintain the present competitive position and that exports of paper and board will rise roughly in proportion to demand in various regions of the world. Under this assumption, exports are estimated at 3.0 million tons in 1975. A free-hand extrapolation of the historical trends in exports, including the projections to 1975, indicate a further rise to 6.2 million tons in 1985.

### *The volume of net imports of paper and board to rise but compose a smaller proportion of total demand*

If the above estimates of imports and exports of paper and board are realized, net imports in 1985 will amount to 4.1 million tons (table 13; fig. 34). This will represent about 4 percent of total demand—a figure substantially below 1966 when net imports accounted for 11 percent of total use. As net imports decline in relative importance, a growing part of total demand will need to be supplied by U.S. mills.

### *Domestic paper and board production to reach 94.4 tons in 1985—about 2.1 times output in 1966*

Production of paper and board in domestic mills in 1966 was 46.7 million tons, more than twice the 21.9 million tons produced in 1948 (table 13; fig. 34; app. D, table 1). By 1985, with the given projections of demand, imports,

[50] United Nations Food and Agriculture Organization. *European timber trends and prospects, a new appraisal, 1950–1975; Pulp and paper prospects in Western Europe; World demand for paper to 1975.*
[51] Richardson, S.D. *Forestry in communist China.* Baltimore: Johns Hopkins Press. 1966.
Skok, Richard A. Letter to James Morgan, Asst. Dir., North Central Forest Exp. Sta., St. Paul, Minn., on a trip through Western Europe to study prospects for U.S. exports of pulp and paper. School of Forestry, University of Minnesota. 1965.
Wilson, Albert W. *Scandinavia improves in world competition.* Pulp and Paper 39 (40): 36–39. Oct. 1965.
Zivnuska, John A. *The forest resources of the United States in a world economy: a problem analysis.* Berkeley: School of Forestry, University of California. 1965.

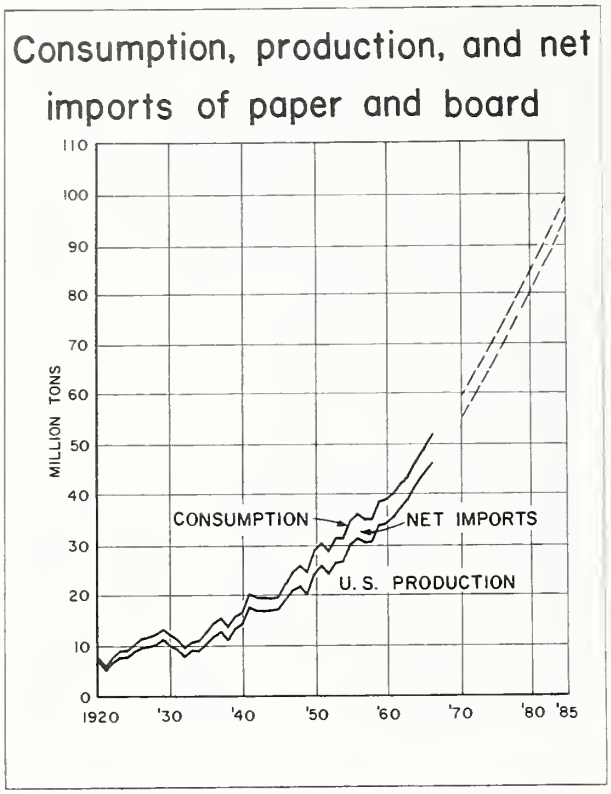


FIGURE 34.

and exports, total domestic production will amount to 97.4 million tons—some 2.1 times output in 1966.

Domestic production of the major grades of paper and board are expected to show somewhat different trends. For example, and because of the decline in the relative importance of imports, domestic output of newsprint is projected to grow more rapidly than projected demands. Anticipated increases in exports of such grades as container board and coarse and industrial paper mean that domestic output of these grades will also rise faster than demand. Domestic production of most grades, however, is expected to increase roughly in line with the projections of demand shown in table 9.

## Projected Demands for Wood Pulp

### *Wood pulp is the chief fibrous material used in the manufacture of paper and board—it has been displacing other materials*

In 1965 a total of 34.2 million tons of wood pulp, or about 95 percent of all the wood pulp consumed, was used in the manufacture of paper and board produced in U.S. mills (table 14; fig. 35).[52]

Wood pulp use in paper and board manufacture in 1966 was about 2.4 times the 14.4 million tons consumed in 1948. The increase in consumption in this period, and in preceding years, has been somewhat faster than the growth in the domestic production of paper and board. This largely reflects the gradual displacement by wood pulp of the other fibrous materials used in the manufacture of paper and board, such as waste paper, straw, rags, and bagasse (table 14; fig. 35). For example, in the years 1948 through 1965 the use of wood pulp per ton of paper and board produced rose from about 0.66 tons to about 0.78 tons (app. F, table 1).[53] In the same period the use of waste paper per ton of paper and board produced dropped from 0.35 tons to 0.23 tons, and other materials from 0.07 tons to 0.02 tons.

### *Wood pulp expected to continue to gradually displace other materials in the manufacture of paper and board; demand in 1985 estimated at 84.2 million tons—2.5 times use in 1965*

These trends are expected to continue, and it is estimated that average use of wood pulp per ton of paper and board produced will rise to 0.87 tons in 1985.[53] The use of waste paper is assumed to decline to about 0.17 tons and other materials to about 0.01 tons.

Estimates of the volume of wood pulp needed for the manufacture of paper and board, based upon the estimates of domestic production of paper and board summarized in table 13 and the extrapolated trends in wood pulp use per ton of output shown in table 14, rise to 84.2

[52] Annual data on production, trade, and consumption of wood pulp, by type, are shown in the tables in appendix E.

[53] Basic statistics on the use of fibrous materials (including wood pulp by type) in the manufacture of the major grades of paper and board are contained in the tables in appendix F. This appendix also includes graphs showing trends in the use of fibrous materials, and wood pulp by type, in the manufacture of the major grades of paper and board, with extrapolations to 1985. The extrapolations of wood pulp and other fibrous materials use shown in these graphs are based on freehand curves fitted to the data showing the use of fibrous materials in each major grade of paper and board in 1947, 1954, 1958, and 1963, and the informed judgment of pulp and paper scientists at the Forest Products Laboratory of the Forest Service. Since most grades of paper and board can be manufactured from a variety of mixtures of fibrous materials and grades of wood pulp, these extrapolations necessarily have a large measure of uncertainty.

TABLE 14.—*Fibrous materials consumed in the manufacture of paper and board, 1919–85* [1]

| | Consumption of fibrous materials | | | | Consumption of fibrous materials per ton of paper and board produced | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Wood pulp | Waste paper | Other | Total | Wood pulp | Waste paper | Other |
| | *Thousand tons* | *Thousand Tons* | *Thousand Tons* | *Thousand tons* | *Tons* | *Tons* | *Tons* | *Tons* |
| 1919 | 6,622 | 4,020 | 1,854 | 748 | 1.110 | 0.674 | 0.311 | 0.125 |
| 1929 | 11,575 | 6,289 | 3,842 | 1,443 | 1.039 | .565 | .345 | .129 |
| 1935 | 10,999 | 6,442 | 3,587 | 969 | 1.050 | .615 | .342 | .092 |
| 1939 | 14,177 | 8,650 | 4,366 | 1,161 | 1.049 | .640 | .323 | .086 |
| 1940 | 15,493 | 9,782 | 4,668 | 1,044 | 1.070 | .675 | .322 | .072 |
| 1945 | 18,969 | 10,825 | 6,800 | 1,344 | 1.092 | .623 | .391 | .077 |
| 1950 | 25,904 | 16,509 | 7,956 | 1,439 | 1.062 | .677 | .326 | .059 |
| 1955 | 31,835 | 21,454 | 9,041 | 1,340 | 1.056 | .711 | .300 | .045 |
| 1960 | 35,703 | 25,700 | 9,032 | 971 | 1.036 | .746 | .262 | .028 |
| 1961 | 36,595 | 26,683 | 9,018 | 894 | 1.025 | .747 | .253 | .025 |
| 1962 | 38,636 | 28,598 | 9,075 | 963 | 1.029 | .762 | .242 | .025 |
| 1963 | 41,117 | 30,220 | 9,613 | 1,285 | 1.048 | .770 | .245 | .033 |
| 1964 | 42,478 | 32,031 | 9,493 | 954 | 1.018 | .767 | .227 | .023 |
| 1965 [2] | 45,089 | 34,156 | 9,923 | 1,010 | 1.031 | .781 | .227 | .023 |
| PROJECTIONS | | | | | | | | |
| 1970 | 57,900 | 44,900 | 12,000 | 1,000 | 1.050 | .815 | .217 | .018 |
| 1975 | 70,100 | 55,800 | 13,300 | 1,000 | 1.050 | .835 | .200 | .015 |
| 1980 | 85,200 | 69,300 | 14,900 | 1,000 | 1.050 | .855 | .183 | .012 |
| 1985 | 102,300 | 84,200 | 17,100 | 1,000 | 1.050 | .865 | .175 | .010 |

[1] Data may not add to totals because of rounding.

[2] Preliminary.

Sources: United States Pulp Producers Association, Inc. *Wood pulp statistics.* New York, 1966. Annual; U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board;* and U.S. Department of Agriculture, Forest Service.

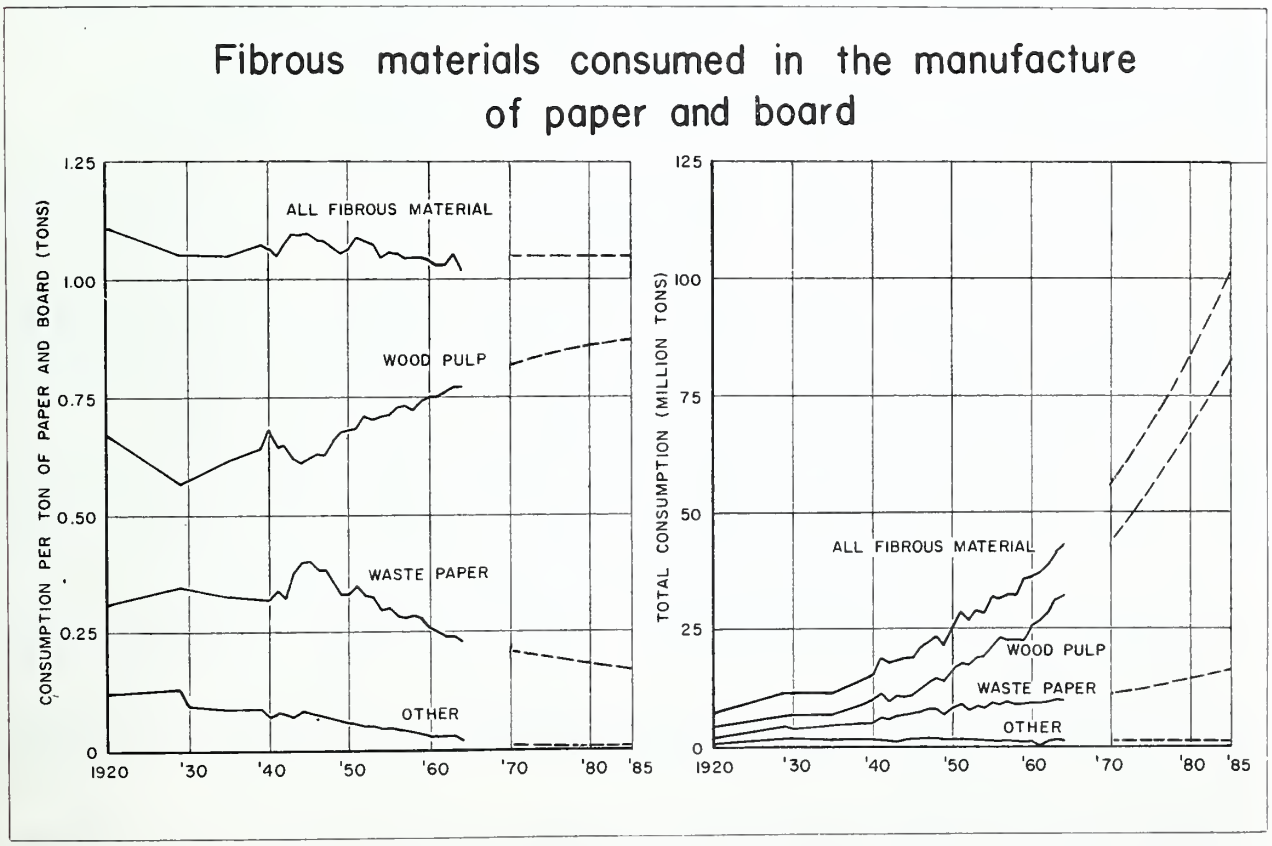


FIGURE 35.

million tons in 1985.[54] This is about 2.5 times consumption in 1965. Because of the large anticipated rise in the domestic production of paper and board, the use of waste paper is also expected to increase, reaching 17.1 million tons in 1985—some 7.2 million tons above 1965. The use of other fibrous materials, however, will remain at about one million tons a year.

### *Divergent trends in the use of major types of wood pulp—sulfate pulps show fastest growth*

There are five major types of wood pulp used in the manufacture of paper and board, i.e., sulfite, sulfate, groundwood, semichemical, and defibrated or exploded pulps. There have been widely divergent trends in consumption of these pulps (table 15; fig. 36). Between 1948 and 1966, for example, consumption of sulfate pulp increased 3.5 times, rising from 6.7 million tons to 23.7 million tons. Use of semichemical pulp also showed fast growth, and groundwood and defibrated or exploded pulps moderate increases. Use of sulfite and soda pulps, however, showed small declines.

On the basis of these trends in consumption, and a detailed analysis of the use of each type of pulp in the manufacture of each of the major grades of paper and board,[53] it is estimated that sulfate pulp consumption in paper and board manufacture in 1985 will amount to 59.0 million tons (table 15; fig. 36). This is about 2.5 times consumption in 1966. The use of semichemical, defibrated or exploded pulps, and groundwood pulps is also expected to grow substantially, but no significant change is anticipated in the use of sulfite and soda pulps.

TABLE 15.—*Apparent consumption of wood pulp by type, 1920–85*

| Year | Total wood pulp | | Dissolving and special alpha[1] | | Sulfite | | Sulfate | | Soda | | Groundwood | | Semichemical | | Defibrated, exploded, and screenings | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total [2] | Annual rate of increase [3] | Total | Annual rate of increase [3] | Total | Annual rate of increase [3] | Total | Annual rate of increase [3] | Total | Annual rate of increase [3] | Total | Annual rate of increase [3] | Total | Annual rate of increase [3] | Total | Annual rate of increase [3] |
| | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* | *Million tons* | *Percent* |
| 1920 | 4.7 | -- | -- | -- | -- | -- | 0.4 | -- | -- | -- | 1.8 | -- | -- | -- | -- | -- |
| 1925 | 5.6 | 4.0 | -- | -- | 2.3 | -- | .8 | 14.9 | 0.5 | -- | 1.9 | 1.1 | -- | -- | -- | -- |
| 1930 | 6.4 | 2.7 | -- | -- | 2.6 | 2.5 | 1.4 | 11.8 | .5 | -- | 1.9 | -- | (4) | -- | -- | -- |
| 1935 | 6.7 | .9 | -- | -- | 2.3 | -- | 2.1 | 8.4 | .4 | -- | 1.5 | -- | 0.1 | -- | -- | -- |
| 1940 | 9.7 | 7.7 | 0.3 | -- | 2.7 | 3.3 | 3.9 | 13.2 | .5 | 4.6 | 1.8 | 3.7 | .2 | 14.9 | 0.3 | -- |
| 1945 | 11.8 | 4.0 | .5 | 10.8 | 2.8 | .7 | 4.9 | 4.7 | .4 | -- | 2.0 | 2.1 | .3 | 8.4 | .8 | 22.1 |
| 1950 | 17.1 | 7.7 | .7 | 7.0 | 3.2 | 2.7 | 3.4 | 11.4 | .6 | 8.4 | 2.5 | 4.6 | .7 | 18.5 | 1.1 | 6.6 |
| 1955 | 22.3 | 5.5 | 1.0 | 7.4 | 3.2 | -- | 11.9 | 7.2 | .5 | -- | 3.0 | 3.7 | 1.4 | 14.9 | 1.3 | 3.4 |
| 1960 | 26.6 | 3.6 | 1.0 | -- | 3.1 | -- | 15.2 | 5.0 | .5 | -- | 3.6 | 3.7 | 2.0 | 7.4 | 1.3 | -- |
| 1961 | 27.8 | 4.5 | 1.0 | -- | 3.1 | -- | 16.1 | 5.9 | .5 | -- | 3.5 | -- | 2.4 | 20.1 | 1.3 | -- |
| 1962 | 29.5 | 6.1 | 1.1 | 10.0 | 3.0 | -- | 17.3 | 7.5 | .4 | -- | 3.7 | 5.7 | 2.5 | 4.2 | 1.4 | 7.7 |
| 1963 | 31.5 | 6.8 | 1.1 | -- | 3.1 | 3.3 | 18.8 | 8.7 | .4 | -- | 3.8 | 2.7 | 2.6 | 4.0 | 1.6 | 14.3 |
| 1964 | 33.8 | 7.3 | 1.2 | 9.1 | 3.1 | -- | 20.9 | 11.2 | .4 | -- | 3.9 | 2.6 | 2.7 | 3.8 | 1.6 | -- |
| 1965 [5] | 35.0 | 3.6 | 1.2 | -- | 3.3 | 6.5 | 21.7 | 3.8 | .2 | -- | 4.3 | 10.3 | 2.9 | 7.4 | 1.5 | -- |
| 1966 [5] | 37.4 | 6.9 | 1.3 | 8.3 | 3.3 | -- | 23.7 | 9.2 | .2 | -- | 4.3 | -- | 3.2 | 10.3 | 1.5 | -- |
| PROJECTED DEMAND | | | | | | | | | | | | | | | | |
| 1970 | 46.4 | 5.8 | 1.5 | 4.6 | 3.3 | -- | 30.1 | 6.8 | .2 | -- | 4.8 | 2.2 | 4.7 | 10.1 | 1.8 | 3.7 |
| 1975 | 57.5 | 4.4 | 1.7 | 2.5 | 3.5 | 1.2 | 38.0 | 4.8 | .2 | -- | 5.7 | 3.5 | 6.4 | 6.4 | 2.0 | 2.1 |
| 1980 | 71.3 | 4.4 | 2.0 | 3.3 | 3.7 | 1.1 | 47.8 | 4.7 | .2 | -- | 6.7 | 3.3 | 8.6 | 6.1 | 2.3 | 2.8 |
| 1985 | 86.4 | 3.9 | 2.2 | 1.9 | 3.8 | .5 | 59.0 | 4.3 | .2 | -- | 7.7 | 2.8 | 10.9 | 4.9 | 2.6 | 2.5 |

[1] Includes a number of highly purified types of wood pulp obtained from the sulfite and sulfate pulping processes.

[2] Data prior to 1940 may not add to totals because of the inclusion in the totals of wood pulps not shown separately by type. In other years, figures in columns may not add to totals because of rounding.

[3] The average annual rate of increase for 5-year periods ending in the specified years except for the years 1961–66 when annual changes are shown.

[4] Less than 50 thousand tons.

[5] Preliminary.

NOTE: Annual data on production, trade, and consumption by type of pulp are shown in the tables in appendix E.

Sources: United States Pulp Producers Association, Inc., op. cit.; U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board;* U.S. Department of Commerce, Business and Defense Services Administration, op. cit.; and U. S. Department of Agriculture, Forest Service.

[54] Small volumes of paper grade pulps are used in the manufacture of nonpaper products such as pressed and molded pulp goods. The projected demands include an allowance for this kind of use.

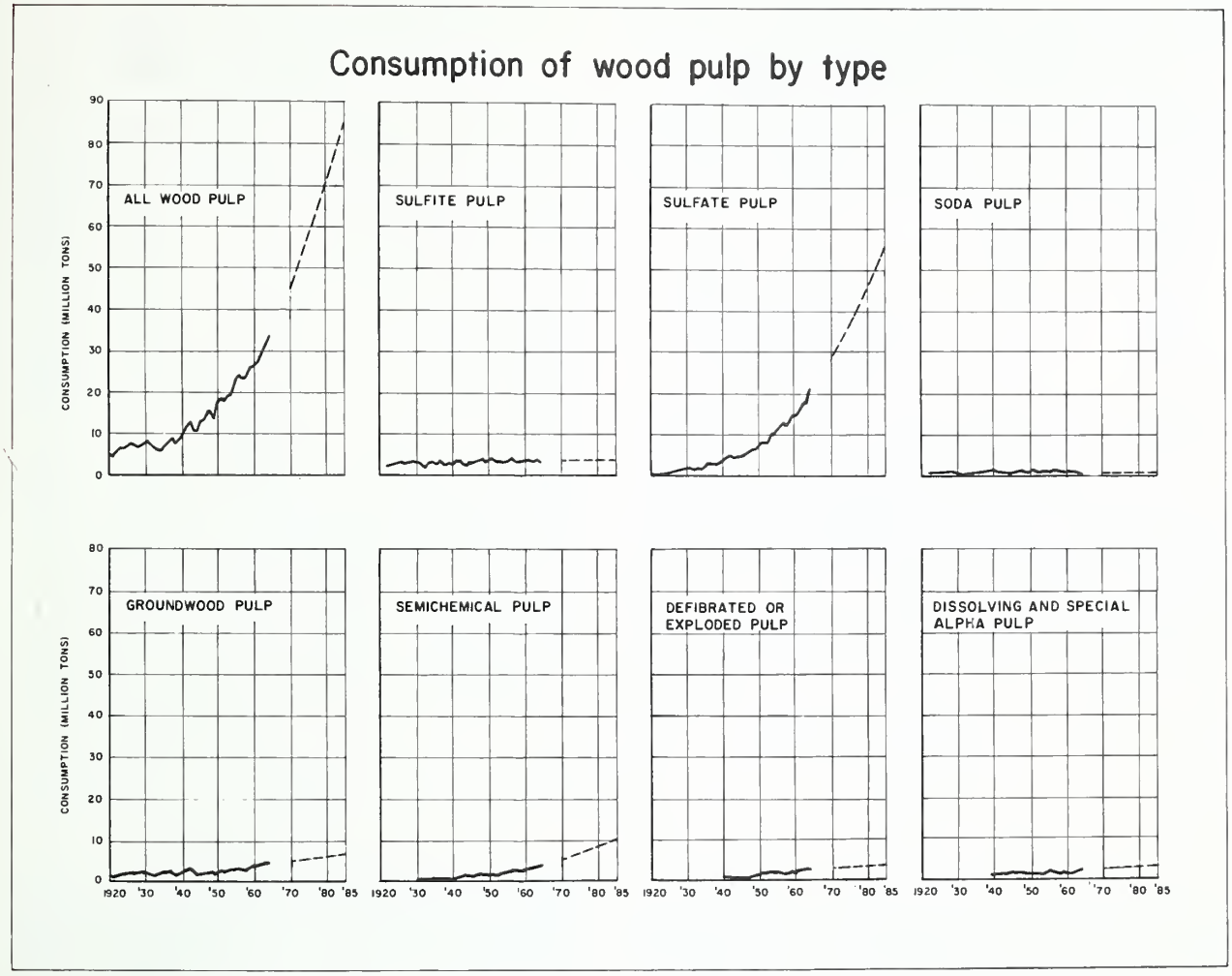


FIGURE 36.

### *About 1.3 million tons of highly purified pulps used in the manufacture of nonpaper products—demand expected to reach 2.2 million tons by 1985*

In addition to the pulps used in the production of paper and board, about 1.3 million tons of highly purified pulps—dissolving and special alpha—were consumed in 1966 in the manufacture of nonpaper products such as rayon, cellulose acetate, cellophane, and nitration products used as a base for gunpowder, lacquers, and certain types of plastics (table 15; fig. 36).[55] This was nearly double the 0.6 million tons consumed in 1948. Per capita use rose from 9 pounds in 1948 to 12 pounds in 1955—a level that, with a little fluctuation, was maintained through 1966 (app. E, table 2).

There was a fairly close relationship between changes in total consumption of the dissolving and special alpha pulps and changes in the gross national product in the 1948–66 period (table 11). On the basis of this relationship, the demand for the highly purified pulps is projected to 2.2 million tons in 1985—some 69 percent above 1966. The associated level of per capita use is 17 pounds, a slight increase over the 1966 average of 13 pounds.

### *Total demand for all types of wood pulp in 1985 estimated at 86.4 million tons—2.3 times use in 1966*

When the projected demands for dissolving and special alpha pulps are added to the pulps required for the manufacture of paper and

[55] The volume figures on dissolving and special alpha pulps in table 15 and quoted in the text include small quantities that are used in the manufacture of paper and board.

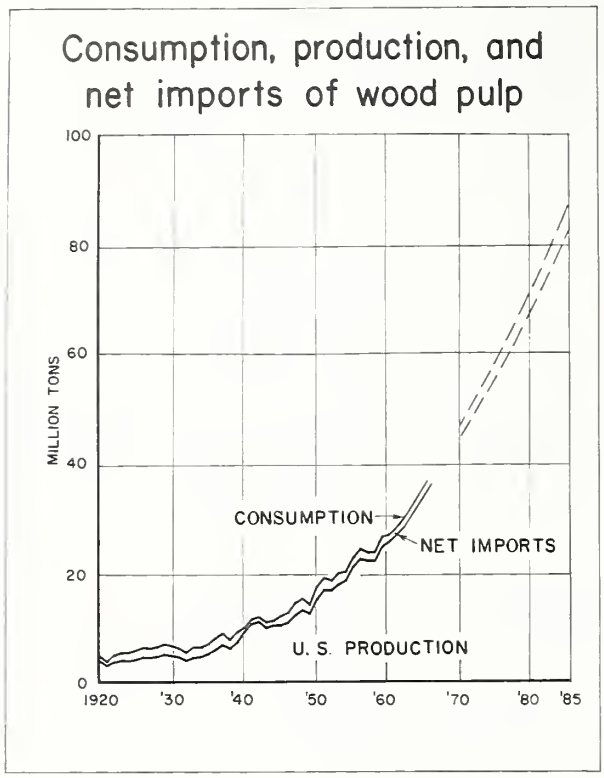


FIGURE 37.

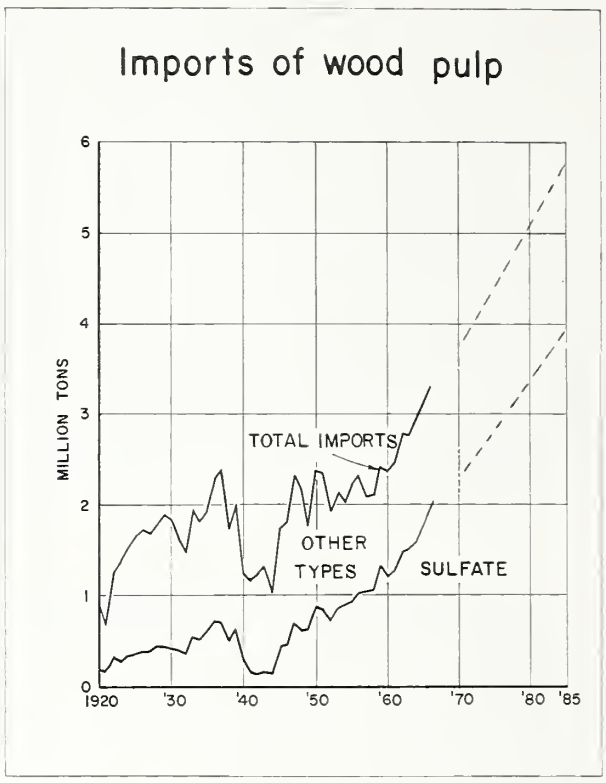


FIGURE 38.

board, it appears that the total demand for wood pulp in 1985 will amount to 86.4 million tons—about 2.3 times consumption in 1966 (table 15; fig. 37). Sulfate paper grade pulps will account for most of the increase although substantial growth is also expected in semi-chemical, defibrated or exploded, and groundwood pulps.

## Projected Imports and Exports of Wood Pulp

For several decades the U.S. has carried on wood pulp trade with many countries of the world. In 1966 imports were 3.4 million tons and exports 1.6 million tons (table 16; fig. 37). The net imports of 1.8 million tons composed about 5 percent of the wood pulp consumed.

### *Imports of sulfate pulp have shown an upward trend and projections indicate further increases—not much change expected for other grades*

From the late 1940's to the late 1950's, wood pulp imports fluctuated around 2.2 million tons a year. Starting in the early 1960's, imports increased and in 1966 totaled 3.4 million tons (fig. 38; app. E, table 11). Canada has been the chief source, accounting for nearly 90 percent of the 1966 total. Nearly all of the remaining imports in 1966, and in preceding years, originated in Sweden, Finland, and Norway.

Imports of the major types of pulp have shown varying trends. In the 1948–58 period, imports of sulfite pulp dropped from about 1 million tons to 0.6 million tons—a level that was maintained without much change through 1966. Dissolving and special alpha pulps, groundwood, and soda pulps showed no trend from 1948 through 1966. Imports of sulfate pulp, however, increased 3.5 times, rising from 0.6 million tons to 2.1 million tons.

Because the imported sulfate pulp is used in paper and board manufacture, there was a close relationship between changes in sulfate pulp imports and changes in U.S. paper and board production in the 1948–66 period (table 11). Projections of sulfate pulp imports, based on this relationship, rise to 3.9 million tons in 1985. Imports of other grades of wood pulp are expected to show small increases over the levels of the late 1950's and early 1960's. Total imports of all grades of wood pulp are estimated at 5.8 million tons in 1985—about 71 percent above 1966.

TABLE 16.—*Apparent consumption, trade, and production of wood pulp, 1920–85* [1]

[Million tons]

| Year | Consumption | Trade | | | U.S. production |
|---|---|---|---|---|---|
| | | Imports | Exports | Net imports | |
| 1920 | 4.7 | 0.9 | (2) | 0.9 | 3.8 |
| 1925 | 5.6 | 1.7 | (2) | 1.6 | 4.0 |
| 1930 | 6.4 | 1.8 | (2) | 1.8 | 4.6 |
| 1935 | 6.7 | 1.9 | 0.2 | 1.8 | 4.9 |
| 1940 | 9.7 | 1.2 | .5 | .7 | 9.0 |
| 1945 | 11.8 | 1.8 | .1 | 1.6 | 10.2 |
| 1950 | 17.1 | 2.4 | .1 | 2.3 | 14.8 |
| 1955 | 22.3 | 2.2 | .6 | 1.6 | 20.7 |
| 1960 | 26.6 | 2.4 | 1.1 | 1.2 | 25.3 |
| 1961 | 27.8 | 2.5 | 1.2 | 1.3 | 26.5 |
| 1962 | 29.5 | 2.8 | 1.2 | 1.6 | 27.9 |
| 1963 | 31.5 | 2.8 | 1.4 | 1.4 | 30.1 |
| 1964 | 33.8 | 2.9 | 1.6 | 1.4 | 32.4 |
| 1965 [3] | 35.0 | 3.1 | 1.4 | 1.7 | 33.3 |
| 1966 [3] | 37.4 | 3.4 | 1.6 | 1.8 | 35.6 |
| PROJECTIONS | | | | | |
| 1970 | 46.4 | 3.8 | 2.4 | 1.4 | 45.0 |
| 1975 | 57.5 | 4.4 | 3.2 | 1.2 | 56.3 |
| 1980 | 71.3 | 5.1 | 4.0 | 1.1 | 70.2 |
| 1985 | 86.4 | 5.8 | 5.0 | .8 | 85.6 |

[1] Data may not add to total because of rounding.
[2] Less than 50 thousand tons.
[3] Preliminary.
[4] Net exports.

NOTE: Annual data on production, trade, and consumption are shown in the tables in appendix E.

Sources: See source note, table 15.

## *Wood pulp exports have been rising in last decade and by 1985 may total 5.0 million tons—some 3.1 times exports in 1966*

Prior to 1953 there was no well defined trend in wood pulp exports (table 16; fig. 39; app. E, table 11). Between that year, however, and 1964 they increased nearly 10 times, rising from about 160 thousand tons to 1.6 million—a volume that was maintained through 1966. Sulfate and dissolving and special alpha pulps accounted for most of the growth in the 1953–64 period.

Wood pulp exports have gone to all parts of the world, although in recent years Western Europe and the Far East (mainly Japan) have been the major markets (app. E, table 13). Exports to Western Europe rose from an average of about 0.1 million tons in the early 1950's to about 0.7 million tons in 1960—a level that was maintained through 1966 without significant change. Shipments to the Far East increased from about 0.1 million tons in the 1950's to about 0.5 million tons in 1966. The volume shipped to Latin America increased slowly in that period, but shipments to Canada showed little change.

Recent studies of the Food and Agriculture Organization of the United Nations indicate that the world demand for wood pulp is likely to grow rapidly (see following tabulation).

| *Region* | *Projected pulp requirements* [1] | |
|---|---|---|
| | *1965* | *1975* |
| | (*Million short tons*) | |
| Western Europe [2] | 19.0 | 29.3 |
| Latin America [3] | 3.3 | 6.1 |
| Far East (except Mainland China) [3] | 6.2 | 12.5 |
| All other (except North America) [3] | 15.7 | 31.8 |

[1] Data for Western Europe cover wood pulp requirements; the data for other regions include other fibrous pulps.
[2] United Nations Food and Agriculture Organization. *Pulp and paper prospects in Western Europe*, p. 165.
[3] United Nations Food and Agriculture Organization. *World demand for paper to 1975*, p. 53.

These and related studies also indicate that many of the major pulp consuming regions do not have enough timber, especially the long-fibered softwood species, to meet the anticipated demands for wood pulp.[56] For example,

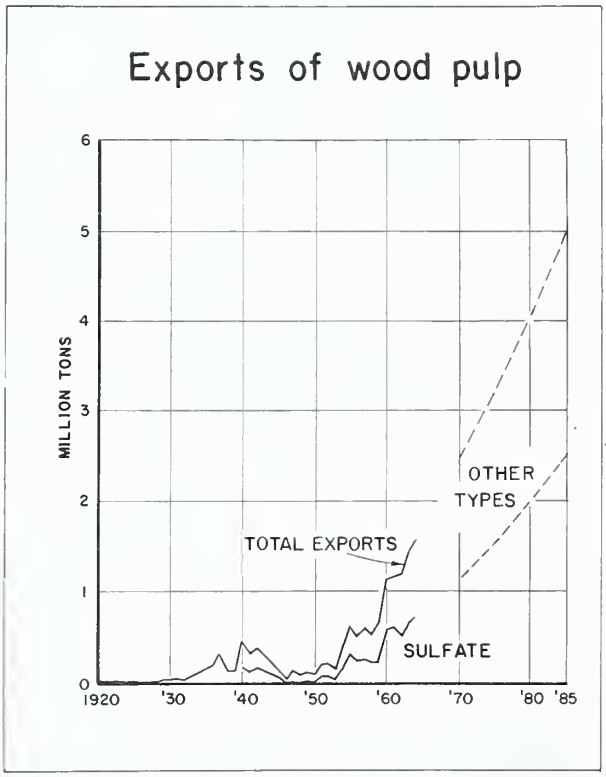


FIGURE 39.

[56] United Nations Food and Agriculture Organization. *European timber trends and prospects, a new appraisal, 1950–1975; Pulp and paper prospects in Western Europe; World demand for paper to 1975.*
Skok, op. cit.
Wilson, op. cit.
Zivnuska, op. cit.

studies of the timber demand and supply situation in Western Europe show that a substantial softwood timber supply deficit is likely to begin to develop in the late 1960's and grow rapidly thereafter. This means that this area will have to look to other parts of the world for wood pulp supplies, particularly the long-fibered pulps made from softwoods. It also means that the countries now importing wood pulp from Western Europe will have to turn to other sources of supply.

There are, of course, many uncertainties associated with the various analyses of prospective demands for wood pulp and timber supplies in the various regions of the world. As an illustration, it is possible that the recent FAO studies have underestimated the prospective timber yields from Western European forests (also in other regions) and that the wood deficit may be smaller than expected.[57] A shift from present use of timber for fuelwood and lumber could also augment supplies.

On the other hand, the recent expansion in wood pulp exports to Western Europe and present marketing difficulties of mills in the Nordic countries suggest that U.S. and Canadian producers can successfully compete in European markets. If this is the case, pulp imports into Western Europe may grow faster than the current FAO studies anticipate.

Granting that the appraisals of world demand and supply are reasonable, it is still very difficult to appraise how U.S. producers will share in what promises to be much larger markets for wood pulp. Both Canada and U.S.S.R. have large volumes of softwood timber suitable for the manufacture of long-fibered pulps. Canada, with its huge reserves of softwood timber, and highly developed pulp and paper industry, is likely to be the principal competitor. The best available evidence indicates that the remote location and lack of access to the unexploited forests in the U.S.S.R. and the growing pressure for increased domestic consumption are formidable barriers to any substantial expansion in the wood pulp exports of that country.[58] FAO studies also indicate that tropical hardwood forests, sometimes mentioned as major potential sources of wood pulp, are not likely to be exploited until the cost of pulpwood from temperate zone forests and plantations rises sharply—something that is not likely to happen in the decades immediately ahead.

Despite all the uncertainties, it does seem reasonable to expect that U.S. pulp producers will supply a growing part of the expanded wood pulp needs of Western Europe and other countries. Exports have therefore been increased more rapidly than the projected foreign requirements for wood pulp shown in the tabulation on page 51. Under this assumption, exports of wood pulp rise to 3.2 million tons in 1975. An extrapolation of the trends in exports to 1975 indicates that by 1985 exports will amount to 5.0 million tons—some 3.1 times 1966. Most of the growth is expected to be in sulfate pulp although dissolving and special alpha pulps may also show a substantial rise.

Given the above estimates of imports and exports, net wood pulp imports will decline rather sharply and by 1985 the Nation will have a net import balance of only 0.8 million tons.

### *Domestic wood pulp production in 1985 estimated at 85.6 million tons—about 2.4 times output in 1966*

When these anticipated net imports are subtracted from estimated domestic demand, it appears that it will be necessary to produce 85.6 million tons of wood pulp in U.S. mills in 1985, some 2.4 times output in 1966 (table 16; fig. 37). This increase is a continuation of a trend that has been rising since the late 1800's (app. E, table 1).

Domestic production of each of the major types of pulp in the projection period is expected to roughly follow the trends in consumption shown in table 15 and figure 36. It is anticipated that sulfate pulp will account for by far the largest part of the increase in domestic output, although semichemical and defibrated or exploded pulps are also likely to show substantial growth.

## Projected Demands for Pulpwood

### *55.4 million cords of pulpwood consumed in U.S. pulp mills in 1966—demand expected to rise to 120.2 million cords in 1985*

Domestic production of wood pulp will be one of the primary determinants of the demand for pulpwood. In 1966 some 55.4 million cords of pulpwood were used to manufacture the 35.6 million tons of wood pulp produced in U.S. mills (table 17; fig. 40; app. G, table 1).[59] This level of pulpwood use was about 2.6 times that in 1948 when consumption was 21.2 million cords.

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[57] This point was emphasized in the recent study by United Nations Food and Agriculture Organization. *World demand for paper to 1975*, p. 68.

[58] Zivnuska, op. cit.

[59] Annual data on production, trade, and consumption of pulpwood are shown in the tables in appendix G.

TABLE 17.— *Apparent consumption, production, and trade of pulpwood, 1920–85* [1]
[Thousand cords]

| Year | Total consumption | Consumption in U.S. mills | | | | | | Net pulpwood imports | Net imports of paper, board, and wood pulp (pulpwood equivalent) |
|---|---|---|---|---|---|---|---|---|---|
| | | Total | U.S. production | | | | Chipped plant byproducts[2] | | |
| | | | Total | Roundwood | | | | | |
| | | | | Total | Softwoods | Hardwoods | | | |
| 1920 | 8,240 | 6,114 | 4,873 | 4,703 | 4,157 | 546 | 170 | 1,241 | 2,126 |
| 1925 | 10,778 | 6,094 | 4,624 | 4,468 | 3,963 | 505 | 156 | 1,470 | 4,684 |
| 1930 | 13,188 | 7,196 | 5,744 | 5,148 | 4,479 | 669 | 596 | 1,452 | 5,992 |
| 1935 | 13,810 | 7,628 | 6,620 | 6,327 | 5,561 | 766 | 293 | 1,008 | 6,182 |
| 1940 | 18,026 | 13,743 | 12,369 | 12,142 | 10,819 | 1,323 | 227 | 1,374 | 4,283 |
| 1945 | 22,795 | 16,912 | 15,254 | 14,851 | 12,772 | 2,079 | 403 | 1,523 | 5,883 |
| 1950 | 33,659 | 23,627 | 20,716 | 19,466 | 16,679 | 2,787 | 1,250 | 1,385 | 10,032 |
| 1955 | 41,989 | 33,356 | 30,948 | 28,598 | 23,363 | 5,234 | 2,350 | 1,704 | 8,633 |
| 1960 | 48,615 | 40,485 | 40,012 | 33,468 | 25,454 | 8,014 | 6,544 | 1,158 | 8,130 |
| 1961 | 50,061 | 42,191 | 40,272 | 32,118 | 23,997 | 8,121 | 8,155 | 1,162 | 7,870 |
| 1962 | 52,535 | 44,070 | 42,772 | 33,811 | 24,866 | 8,945 | 8,961 | 1,292 | 8,465 |
| 1963 | 54,100 | 46,435 | 44,708 | 34,471 | 25,044 | 9,426 | 10,237 | 1,543 | 7,665 |
| 1964 | 58,068 | 50,148 | 49,497 | [3] | [3] | [3] | [3] | 1,391 | 7,920 |
| 1965 [4] | 61,778 | 52,828 | 52,618 | [3] | [3] | [3] | [3] | 1,149 | 8,950 |
| 1966 [4] | 65,220 | 55,400 | 54,500 | 40,500 | 28,800 | 11,700 | 14,000 | 1,043 | 9,820 |
| PROJECTIONS | | | | | | | | | |
| 1970 | 75,100 | 66,700 | 65,200 | 50,700 | 34,900 | 15,800 | 14,500 | 1,500 | 8,400 |
| 1975 | 91,400 | 83,400 | 81,900 | 66,100 | 44,400 | 21,700 | 15,800 | 1,500 | 8,000 |
| 1980 | 108,400 | 101,400 | 99,900 | 55,700 | 55,700 | 27,200 | 17,000 | 1,500 | 7,000 |
| 1985 | 125,600 | 120,200 | 118,700 | 100,700 | 66,800 | 33,900 | 18,000 | 1,500 | 5,400 |

[1] Data may not add to totals because of changes in inventories, rounding, and statistical discrepancies in imports.

[2] A growing part of pulpwood reported as chips by the consuming pulp plants in recent years, and especially in 1965 and 1966, has come from roundwood (chipped at plants away from the consuming mill) and not from plant byproducts. Projections show only the expected chip production from plant byproducts.

[3] Not available.

[4] Preliminary.

Sources: U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board; U.S. imports of merchandise for consumption.* FT 125. Annual; and *U.S. exports: commodity by country.* FT 410. Annual.
American Paper Institute. *Monthly statistical summary (3).*
American Pulpwood Association. *Pulpwood statistics.* New York, Annual.
U.S. Department of Agriculture, Forest Service.

Of the pulpwood consumed in U.S. mills in 1964, the latest year for which data are available on consumption by pulping process, about 65 percent, or 32.3 million cords, was used in the manufacture of sulfate pulp (app. G, table 2). Another 13 percent was used for sulfite pulps, and most of the remainder for groundwood and dissolving and special alpha pulps.

Average pulpwood use in cords per ton of pulp produced in 1964 was as follows: [60]

| *Type of pulp* | *Pulpwood consumed* (Million cords) | *Wood pulp produced* (Million tons) | *Pulpwood consumption per ton of pulp produced* (Cords) |
|---|---|---|---|
| Dissolving and special alpha | 3.2 | 1.5 | 2.2 |
| Sulfite (includes soda) | 6.2 | 3.0 | 2.1 |
| Sulfate | 32.3 | 20.0 | 1.6 |
| Groundwood | 3.6 | 3.6 | 1.0 |
| Semichemical | 2.8 | 2.7 | 1.0 |
| Defibrated or exploded | 1.5 | 1.6 | 0.9 |
| All grades | 49.7 | 32.4 | 1.5 |

As illustrated in table 3 and figure 1 in appendix G, these averages have been maintained for some time without significant change.[61] On the basis of this apparent stability in requirements and expectations about the kinds of wood that will be used and pulping processes, it has been assumed that the present averages will remain unchanged through 1985 for all types of pulp except sulfate. A small drop in average use to 1.5 cords per ton in 1985 has been assumed for this type, largely in anticipation of increasing use of higher yield hardwood pulpwood.

When the above averages are multiplied by the estimates of domestic output of wood pulp by type, it appears that the prospective demand for pulpwood in U.S. mills will total 120.2 million cords in 1985—about 2.2 times use in 1966 (table 17).

[60] U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board, 1964*, p. 3.

[61] There have been many technological developments which have tended to increase pulp yields. However, these have apparently been offset by increases in the production of bleached and semibleached paper pulps and the dissolving and special alpha pulps which, because of processing losses, require more wood per unit of output.

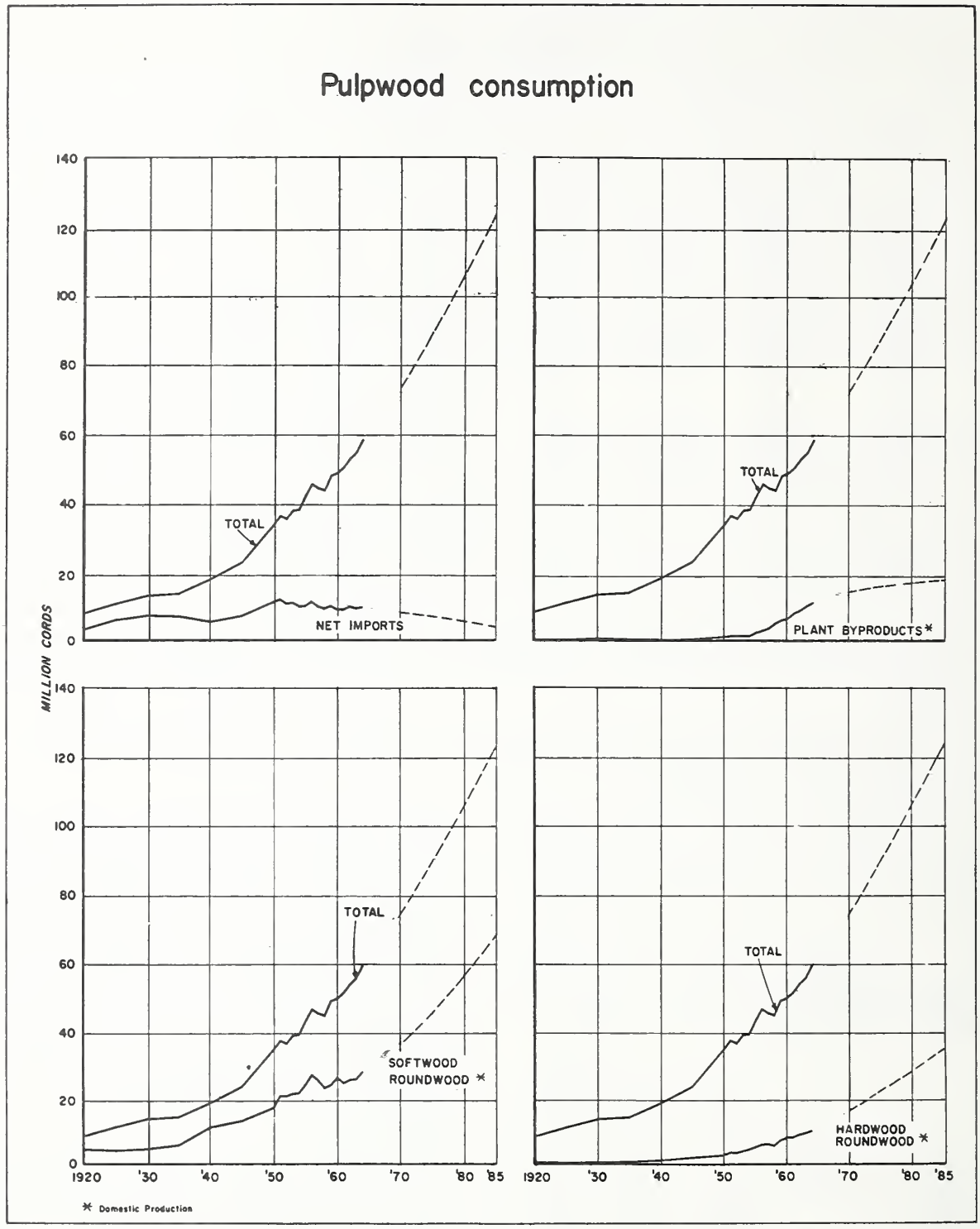

Pulpwood consumption
MILLION CORDS
140
120
100
80
60
40
20
0
TOTAL
NET IMPORTS
TOTAL
PLANT BYPRODUCTS *
TOTAL
SOFTWOOD ROUNDWOOD *
TOTAL
HARDWOOD ROUNDWOOD *
1920
'30
'40
'50
'60
'70
'80
'85
* Domestic Production

FIGURE 40.

### *Imports expected to supply only a small part of the pulpwood demands of U.S. pulp mills*

About 1.0 million cords, or 2 percent of the pulpwood consumed in U.S. mills in 1966, was imported, largely from Canada (table 17). Net imports of pulpwood have fluctuated around 1.5 million cords a year for several decades (app. G, table 1)—and it has been assumed that they will continue at about the same volume through 1985.

### *Domestic pulpwood production to increase 2.2 times by 1985, rising from 54.5 million to 118.7 million cords*

If these net imports are realized, domestic pulpwood production in 1985 will amount to 118.7 million cords—some 2.2 times the 54.5 million cords produced in 1966 (table 17).

In the 1959–66 period domestic pulpwood production increased by about 2.5 million cords a year. By the end of the projection period, production will be growing by about 3.8 million cords a year. The rate of increase underlying the projections, however, is lower than the historical averages because of the projected slackening off in the rate of growth in the demand for paper and board.

### *The use of chips from plant byproducts by pulp mills has shown rapid growth and further increases are expected*

The use of chips (produced from the plant byproducts of sawmills, veneer mills, and other wood-using plants) by wood pulp mills increased from 1.0 million cords in 1948 to 14.0 million cords in 1966[62] (table 17; fig. 40). As a result of such rapid growth, most of the coarser softwood plant byproducts such as slabs, edgings, and veneer cores that can be considered economically available are currently being utilized. However, there is still a large volume of sawdust and other fine residues, estimated at about 10 million cords in 1962, available for utilization. There is also a substantial volume of unused coarse hardwood residues in the East.

Recent improvements in the technology of pulping fine residues and in the use of hardwoods indicate that greater use of present residues is likely. In addition, a larger volume of residues of all kinds is likely to be available as use for fuel declines and as lumber and veneer production increases. With these considerations in mind, it was estimated that the consumption of plant byproducts will rise to 18 million cords in 1985—about 6.4 million cords more than in 1964.

### *Production of round pulpwood was 40.5 million cords in 1966—projections show rise to 100.7 million cords in 1985*

If the use of plant byproducts increases as anticipated, domestic production of round pulpwood in 1985 will total 100.7 million cords (table 17; fig. 40). This is about 2.5 times the 40.5 million cords produced in 1966.

Softwood species, such as southern pine, spruce, true fir, hemlock, jack pine, and Douglas-fir, composed about 71 percent of the round pulpwood produced in 1966. Hardwoods, chiefly aspen and gum, with small volumes of other species such as birch, beech, maple, cottonwood, willow, and oak, accounted for the remainder.

Softwoods have traditionally been preferred for pulping—accounting for most of the round pulpwood produced in past decades. In recent years, however, in response to technological advances in pulping processes, the availability of large volumes of hardwoods at relatively lower cost per ton of fiber, and the improvement in the properties of many grades of paper and board resulting from the use of hardwood pulps in the furnish, the use of round hardwood pulpwood has been rising much more rapidly than round softwoods. For example, the output of round hardwoods rose at an average annual rate of 9.3 percent in the 1948–66 period—3 times that for softwoods.

Further rapid expansion in the use of round hardwoods is anticipated and total production is estimated at 33.9 million cords in 1985, about 2.9 times production in 1966 (table 17; fig. 40). With this level of output, round softwood production would be 66.8 million cords—some 2.3 times the 1966 volume.

### *Round pulpwood production in 1985 is 44 percent above estimate in Timber Trends*

The projections of round pulpwood production, shown in table 17, are substantially above those in the recent Forest Service report, *Timber Trends in The United States*.[63] For example, to produce the required round pulpwood in 1985, it will be necessary to cut about 7.0 billion cubic feet from the timber growing stock in domestic forests. This is about 2.1 billion cubic feet, or 44 percent, above the 1985 pulpwood cut projected in the Timber Trends

[62] A growing part of pulpwood reported as chips by the consuming pulp plants in recent years, and especially in 1965 and 1966, has come from roundwood (chipped at plants away from the consuming mill) and not from plant byproducts. Projections show only the expected chip production from plant byproducts.

[63] U.S. Department of Agriculture, Forest Service, p. 59.

report.[64] The additional volume of wood required for pulpwood raises the total projected timber cut of all products from the Timber Trends estimate of 15.3 billion cubic feet[64] to about 17.4 billion cubic feet—an increase of 14 percent.

The analysis in the Timber Trends report showed that timber supplies, under the cutting and management assumptions used in that study, would be above the projected timber demands until about 1990. The analysis also indicated, however, that there would be substantial declines in the size and quality of trees available to industry, if the timber cut increased as envisaged and forest management programs continued near current levels. Because smaller and poorer quality trees cost more to log and process and have lower product values, the outlook was for rising costs of production and increased marketing problems for most timber-using industries.

Given an increase in the cut of round pulpwood of the magnitude envisaged above, and assuming the cut of other timber products and levels of management would be about the same as assumed in the Timber Trends study, projected timber supplies would fall short of the total timber cut around 1980. In actual fact, the current cut of most other timber products is above the projections in the Timber Trends study. If this continues and the level of management remains about the same, timber cut would exceed supplies in the late 1970's. This prospective supply-cut balance, along with declines in the size and quality of trees, point to intensification in the competition for timber and increases in production and marketing costs beyond the levels which appeared likely from the Timber Trends analysis.

The impact of rising costs is expected to bear most heavily on the lumber and veneer industries which require relatively large sized and high quality timber for low-cost processing. The wood supply and cost outlook for the pulp and paper industry is more favorable. In the last decade and a half the prices paid for pulpwood have not shown much change despite the sharp rise in production and increasing stumpage and saw log prices. The price stability for pulpwood partly reflects progress in the utilization of residues of other wood-using plants and the less desirable species, especially hardwoods. Further adjustments and adaptations in using prospective wood supplies such as fine sawmill residues and hard hardwoods appear feasible.

Technological improvements in logging, wood handling, and transportation could also hold costs down. Future cost trends for pulpwood will thus depend in part on investments in research designed to develop means of using the available wood supplies and achieving potential cost reductions. Future pulpwood cost trends will also partly depend on the level of investment in forest management programs, especially those concerned with (1) reducing timber losses by increased protection from fire, insects, and disease; (2) increasing timber supplies by planting or seeding of productive sites; and (3) opening up inaccessible timber in the West through road construction programs.

### *Total pulpwood consumption in the U.S., including pulpwood equivalents of net imports of paper, board, and wood pulp, was 65.2 million cords in 1966—projections show a rise to 125.6 million cords in 1985*

In addition to the pulpwood consumed in U.S. mills, there is a substantial volume imported in the form of pulp, paper, and board. In 1966, for example, the pulpwood required to produce the net imports of these products amounted to 9.8 million cords (table 17; fig. 40; app. G, table 1). When this is added to the 55.4 million cords used in domestic mills, the volume of pulpwood consumed by the American people totaled 65.2 million cords.

There has been little change in the pulpwood equivalent of the net imports of paper, board, and wood pulp in recent years. However, and largely because of the anticipated rapid increases in exports of wood pulp and board, such net imports are expected to drop to about 5.4 million cords in 1985. Given this level of net imports, the volume of pulpwood required to meet the Nation's needs for pulp and paper will total 125.6 million cords—nearly double consumption in 1966.

[64] Ibid., p. 70.

# HIGHLIGHTS

In the first part of this study some general guides on the use of regression equations, including choice of independent variables, equation forms, and base time periods were developed. These are:

1. For those grades of paper and board where there has been little or no increase in per capita use in the time period used as the base for the projection and no indication of change, population or households are the most logical choices for projecting longrun trends in demand (aggregate demand).

2. For those grades where there has been a slow increase in per capita use, presumably in response to growth in the output of goods and services or income, a measure of economic activity such as the gross national product, disposable personal income, or industrial production is the most logical choice for projecting longrun trends in demand (aggregate demand).

3. For those grades where there has been a relatively rapid increase in per capita use, per capita gross national product or per capita disposable personal income is the most logical choice for projecting longrun trends in demand (per capita demand).

4. Simple regression equations are preferable to multiple regression equations for making longrun projections of demand for paper and board with the independent variables that are available for use.

5. An equation with the general form $Y = a + b \log X$ is preferable for making longrun projections of demand for most grades of paper and board. However, for grades where consumption has been rising rapidly, the equation $Y = a + b X$ may be the best choice, at least for the years immediately ahead. There was no evidence that the equation $\log Y = a + b \log X$, in which constant income elasticity of demand is assumed, is a desirable choice for projecting longrun trends in demand for any grade of paper or board, although under some circumstances it may be appropriate for shortrun projections.

6. The post World War II years are preferable as the base time period for making longrun projections for all grades of paper and board. Observations for individual years, particularly those near the beginning and ending of the base period which show substantial deviation from the regression line describing the relationship, should be carefully examined and omitted if abnormal or special conditions prevailed. The effects of using observations that may be high or low because of cyclical fluctuations should also be carefully considered, especially if they occur near the beginning or ending of the period used as the base for the projections.

These guides were used in projecting demands for major grades of paper and board. The projections indicate that the demand for paper and board will rise from 52.4 million tons in 1966 to 72.1 million tons in 1975 and 101.5 million tons in 1985—levels that are respectively 38 percent and 94 percent above 1966. Domestic production of paper and board in 1985 is estimated at 97.4 million tons, about 2.1 times output in 1966. Net imports are estimated at 4.1 million tons—29 percent below 1966.

Projected demands and domestic production for each of the major grades of paper and board show substantial increases over 1966, especially so for container board, newsprint, and bending board.

Domestic wood pulp demands are estimated at 86.4 million tons in 1985. This is 2.3 times the 37.4 million tons consumed in 1966. Most of the increase is expected to be for sulfate paper grade pulps although substantial growth is anticipated in semichemical, defibrated or exploded, and groundwood pulps.

The United States net wood pulp import balance is projected to slowly decline. Domestic production of wood pulp will thus rise somewhat more rapidly than domestic requirements reaching 85.6 million tons in 1985—some 2.4 times output in 1966.

Pulpwood demand in U.S. pulp mills in 1985 is estimated at 120.2 million cords—about 2.2 times the 55.4 million cords used in 1966. Domestic pulpwood production in 1985 is estimated at 118.7 million cords—118 percent above output in 1966.

Given an increase in the cut of pulpwood of this general magnitude, and assuming the cut of other timber products and the level of forest management would be about the same as in the recent Forest Service study, *Timber Trends in the United States*, projected timber supplies would fall short of the total timber cut around 1980. This prospective supply-cut balance, along with declines in the size and quality of trees available to industry, points to intensification in

the competition for timber and rising production and marketing costs.

The impact of rising costs is expected to bear most heavily on the lumber and veneer industries which require relatively large-sized and high-quality timber for low-cost processing. Because of its capacity to utilize the residues of other wood using industries, small-sized low-quality timber, and the less desirable species, the outlook for the pulp and paper industry is more favorable. Much will depend, however, on the success attained in adapting to the use of prospective wood supplies such as fine sawmill residues and hard hardwoods; technological improvements in logging, wood handling, and transportation; and levels of investment in forest management programs aimed at increasing timber supplies.

# APPENDIX A

## Graphic Analysis of the Relationships Between Consumption of the Major Grades of Paper and Board and Selected Independent Variables

### Appendix A Contents

[Note: The circled dots on the charts in this appendix are the World War II years 1942–46 inclusive. Because of price, production, and other government controls in that period, the relationships between consumption of the major grades of paper and board and the various independent variables were abnormal. The data for these years were not considered in analyzing the graphic relationships or included in the statistical analysis in appendix B and the main body of the report.]

## Appendix A Contents—Continued

## Appendix A Contents—Continued

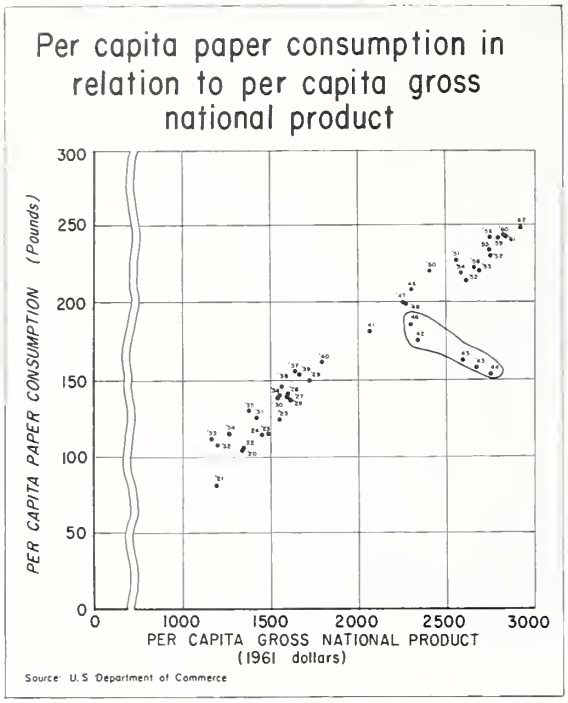



FIGURE 1

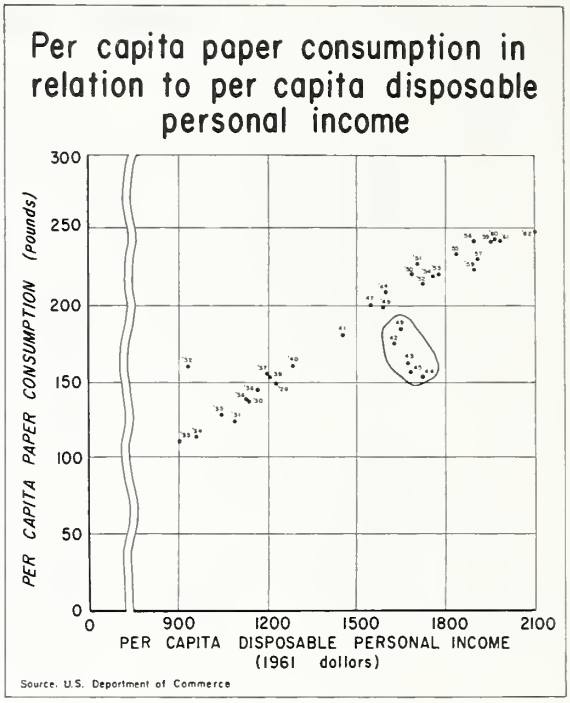



FIGURE 2

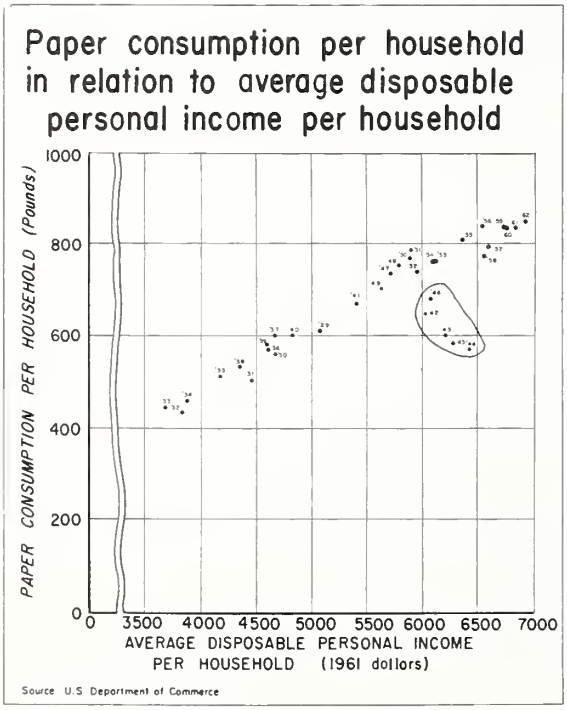



FIGURE 3

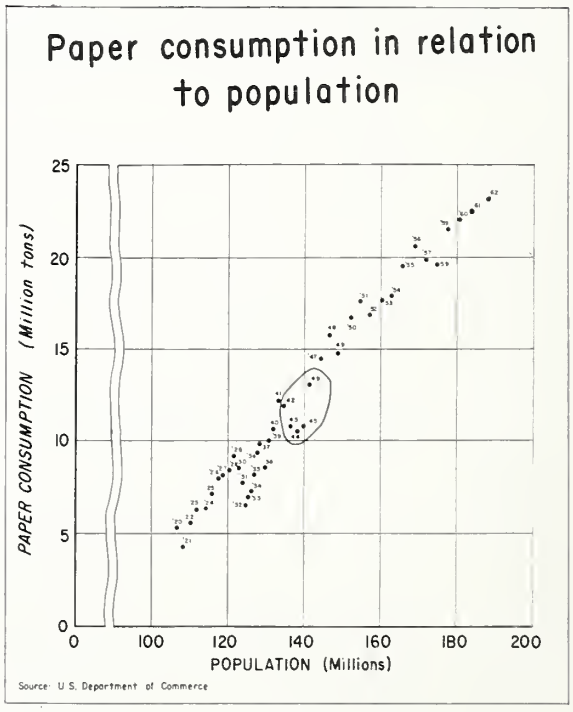



FIGURE 4

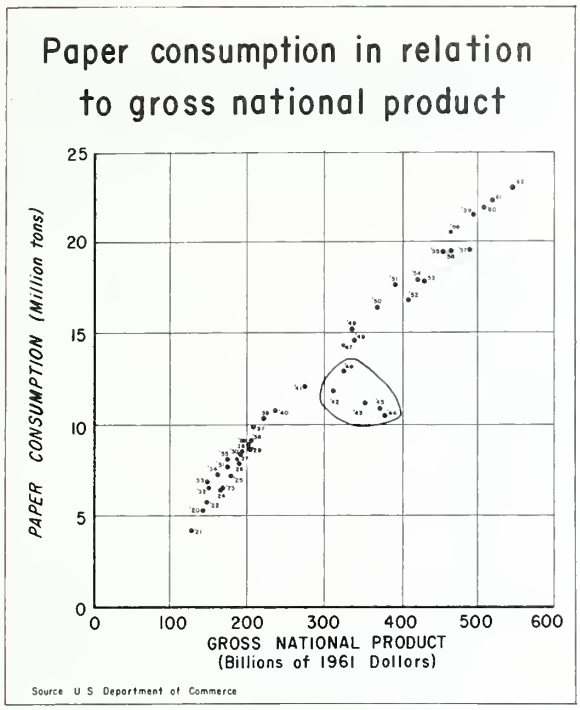



FIGURE 5

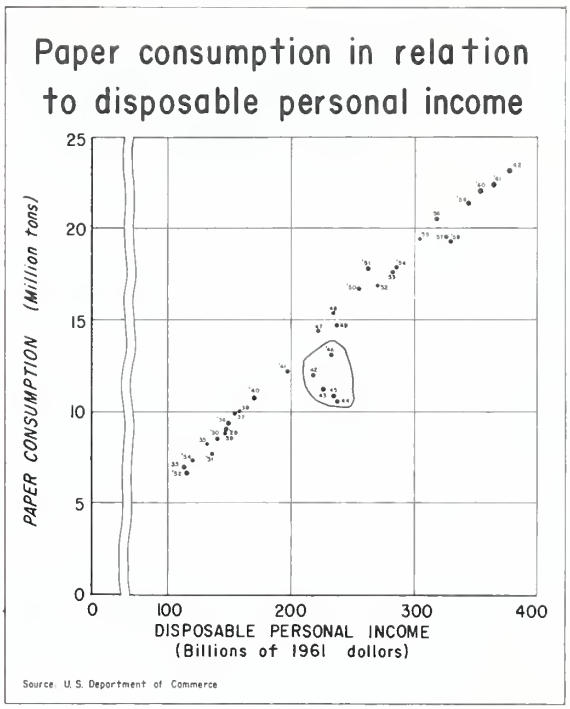



FIGURE 6

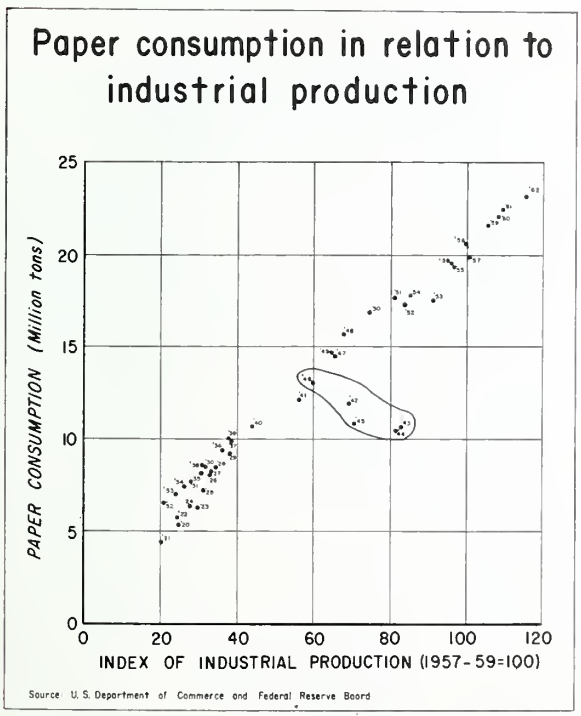
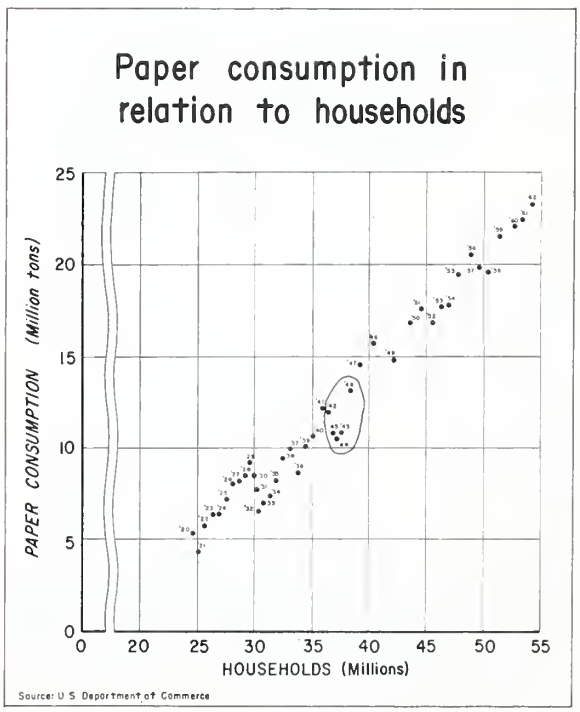



FIGURE 7

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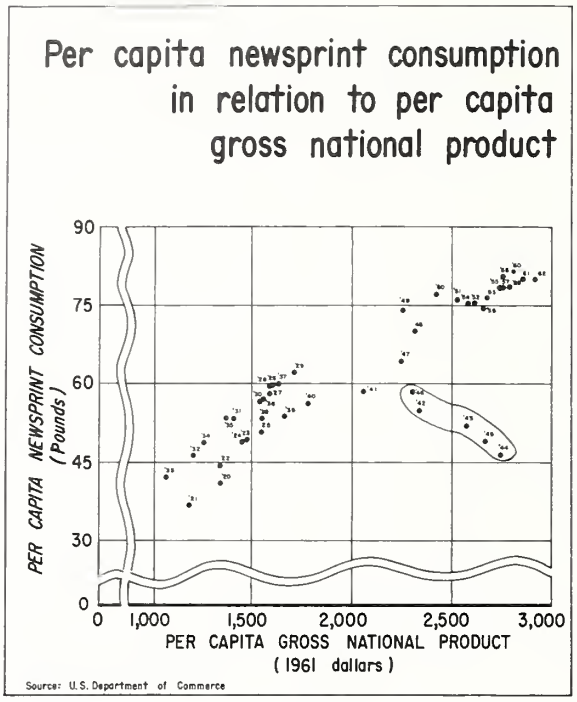


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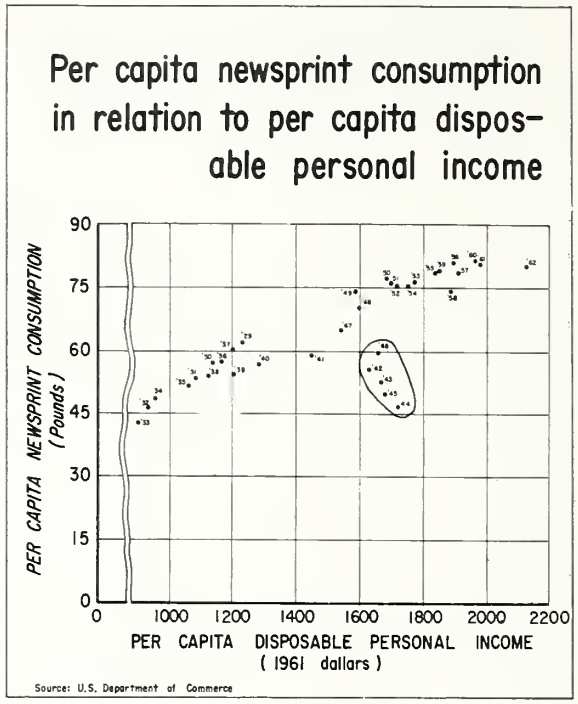


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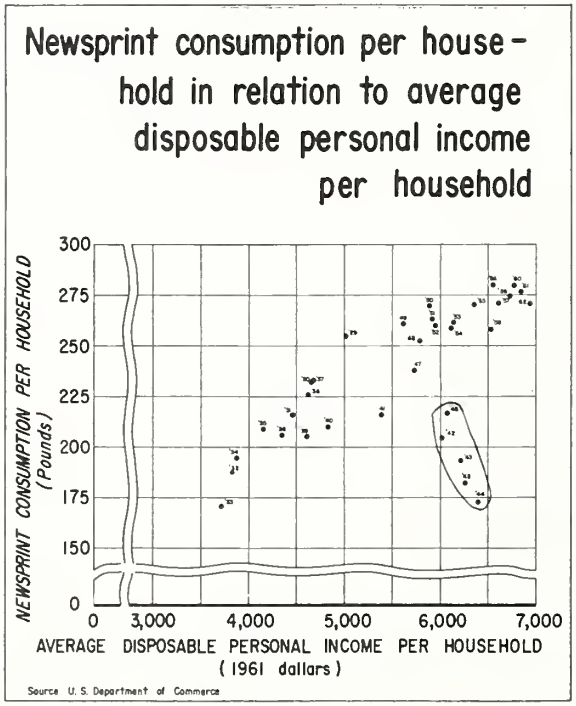


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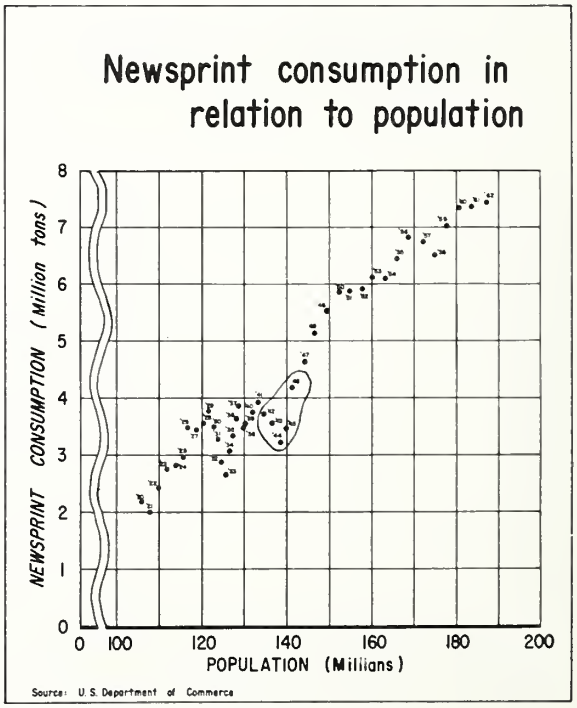


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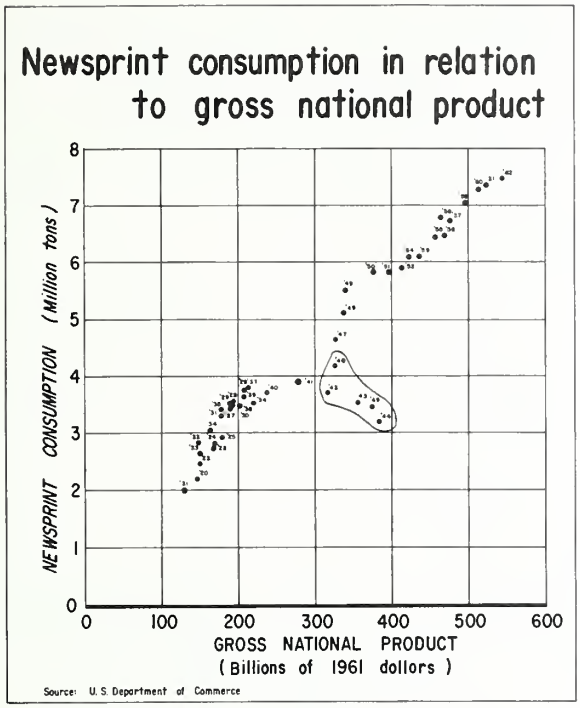


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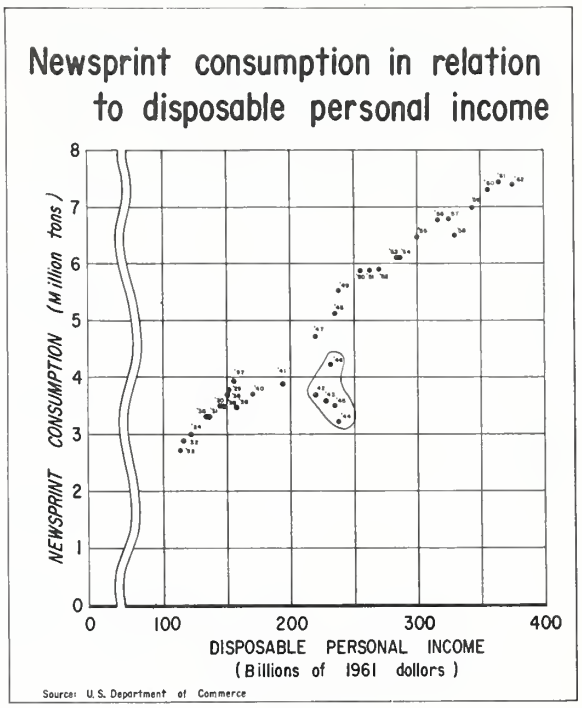


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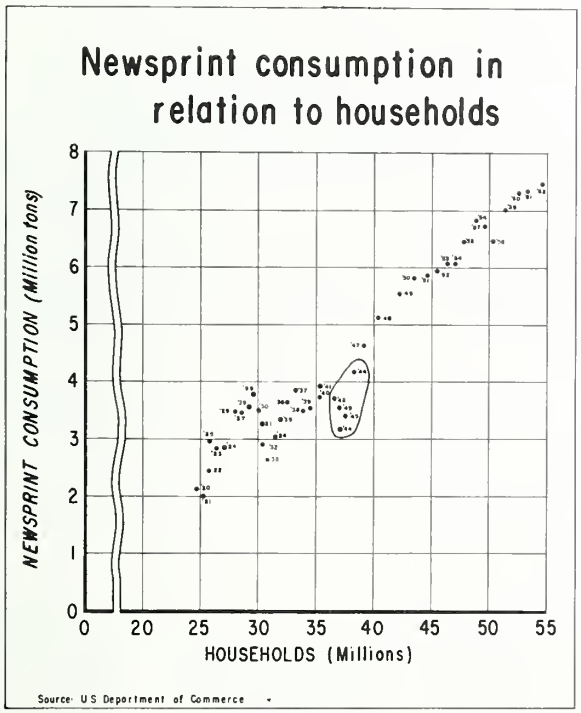


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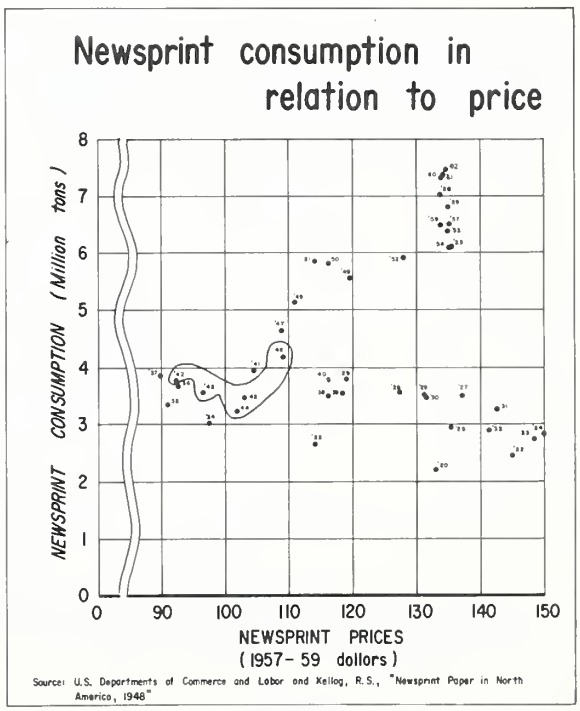


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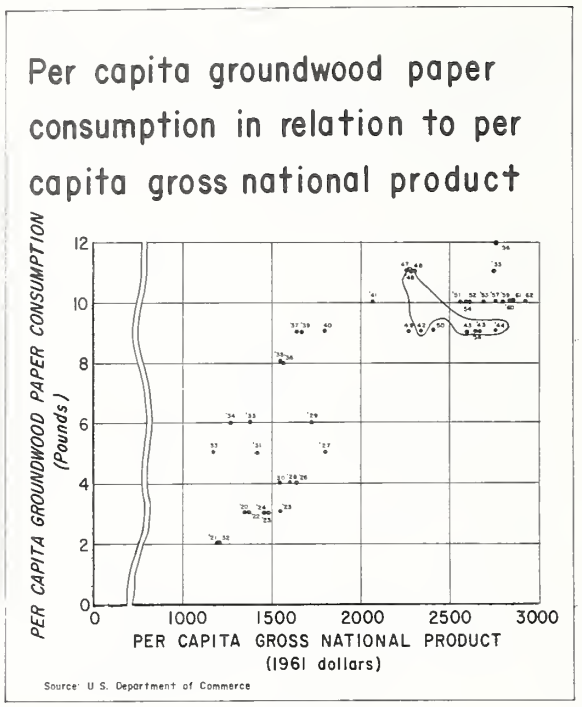


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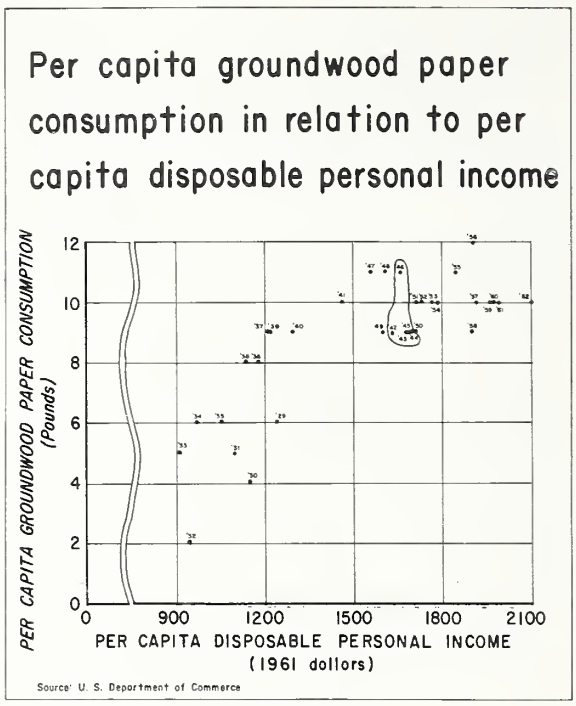


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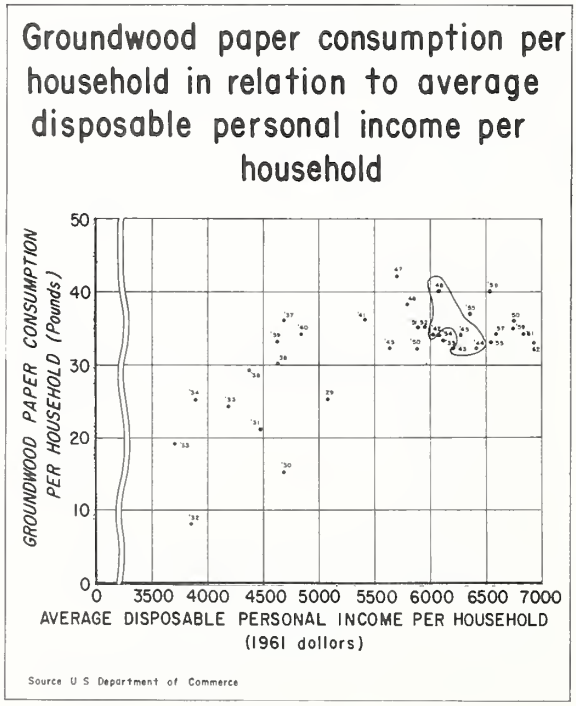


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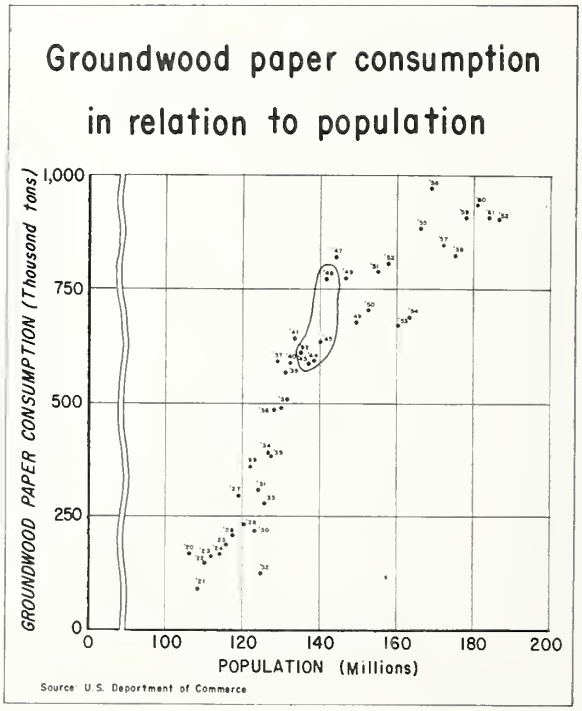


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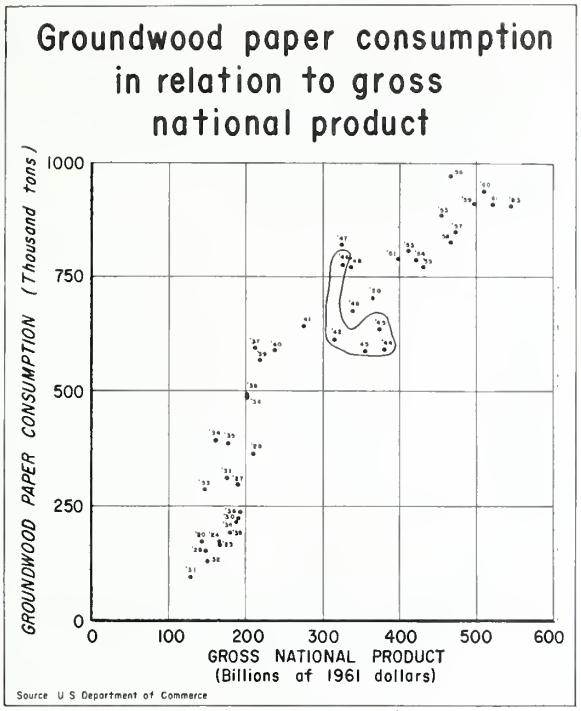


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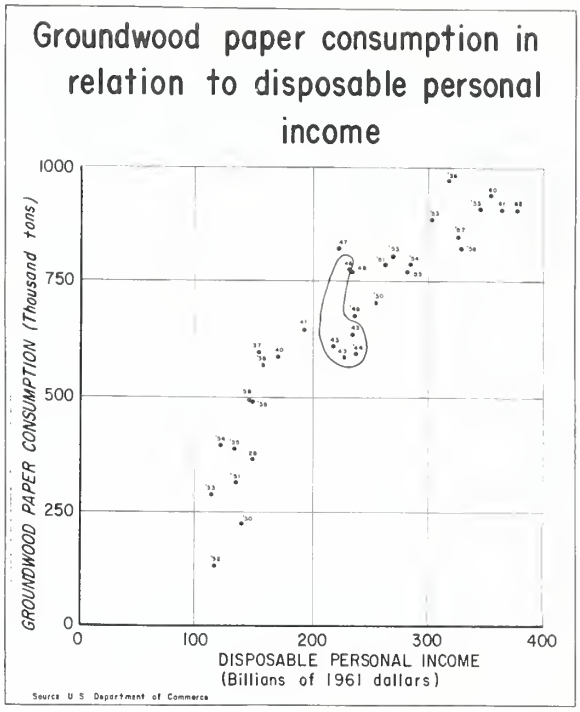


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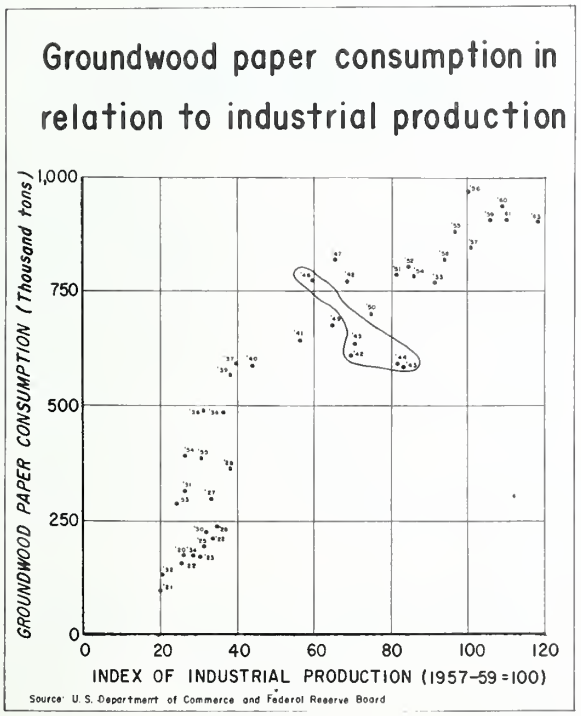


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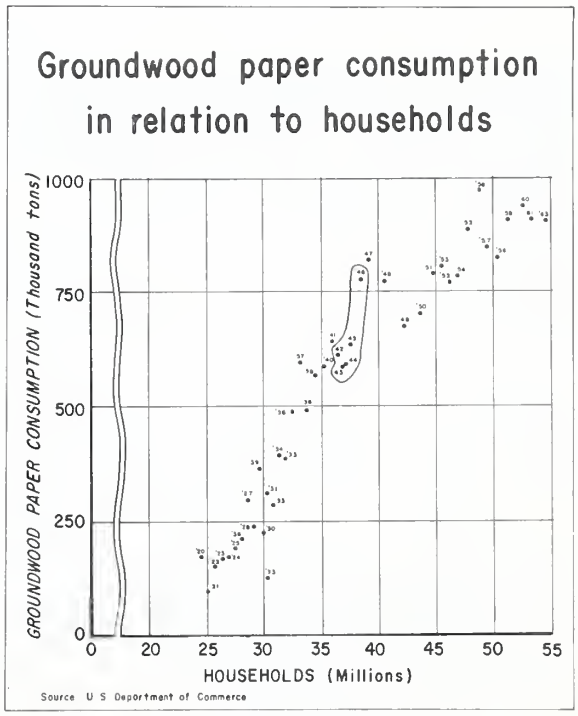


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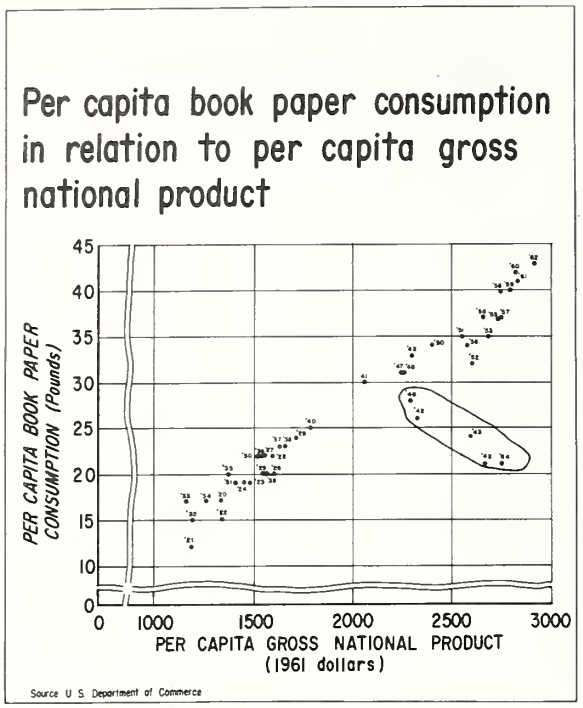


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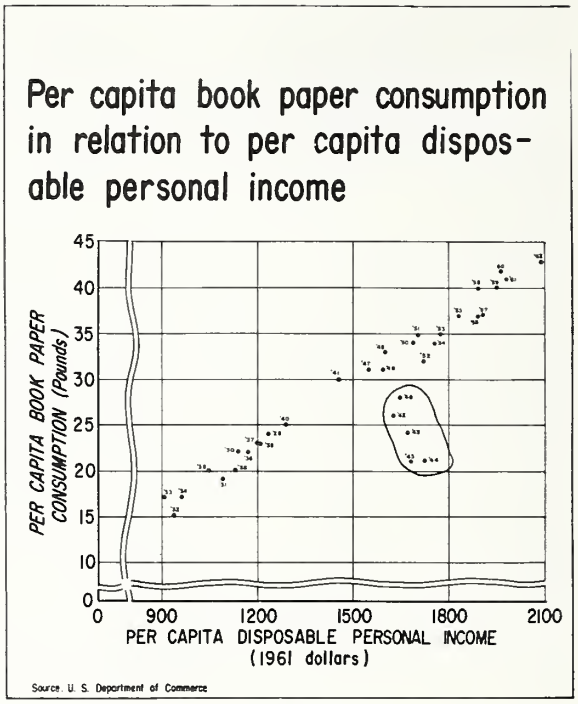


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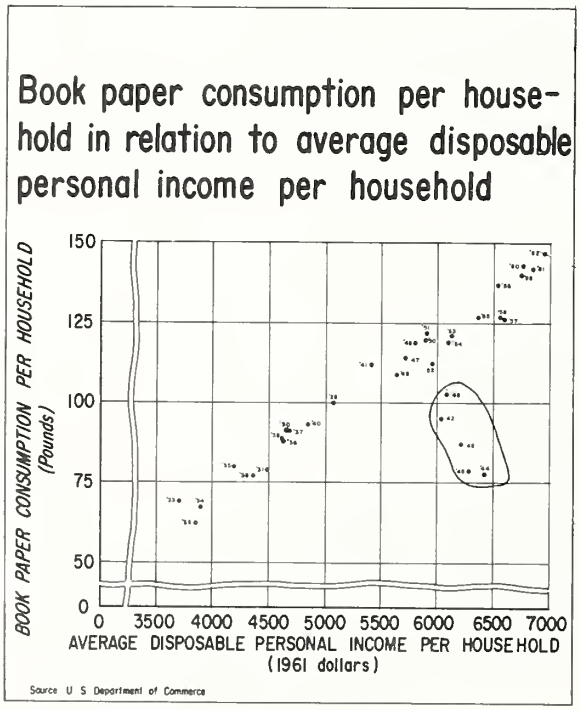


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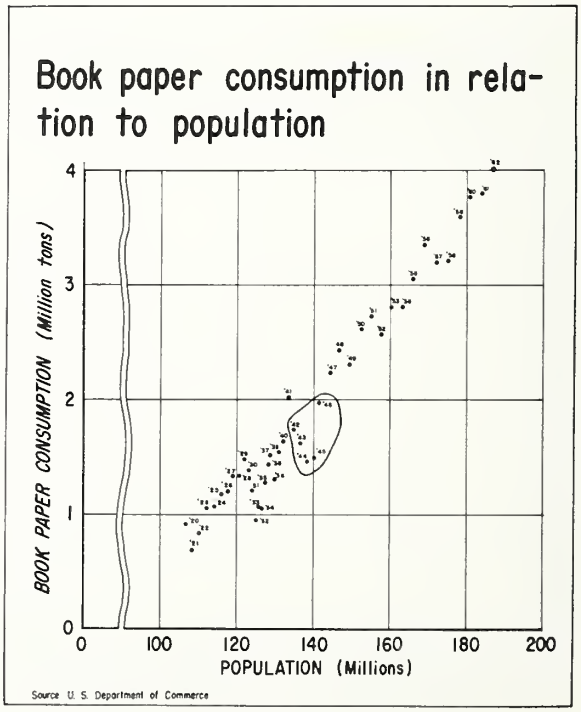


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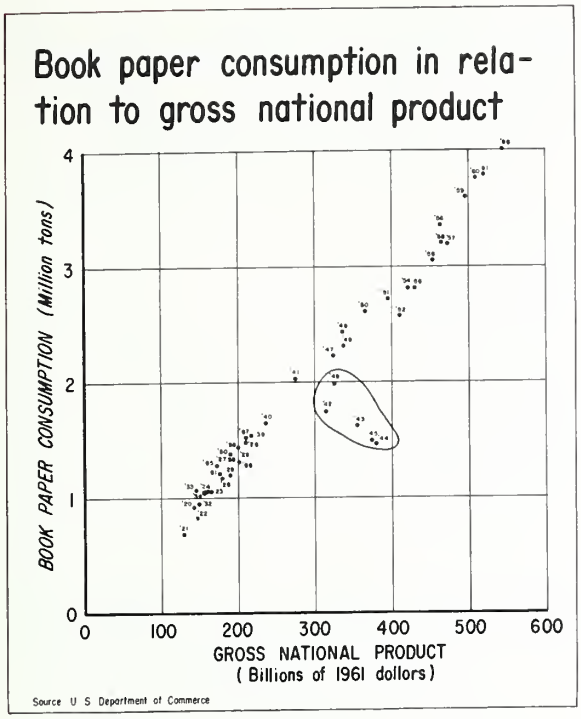


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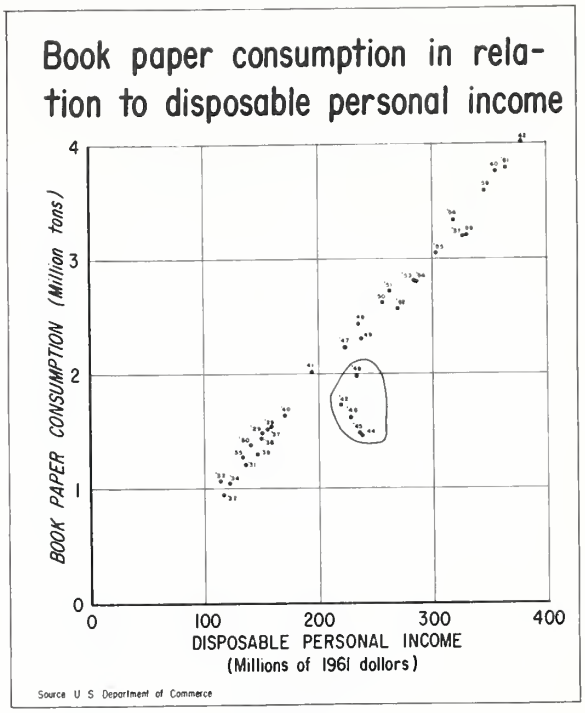


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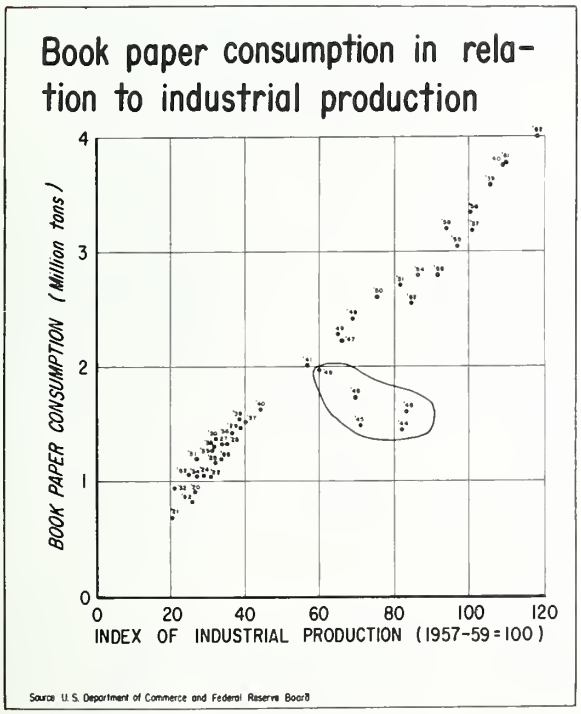


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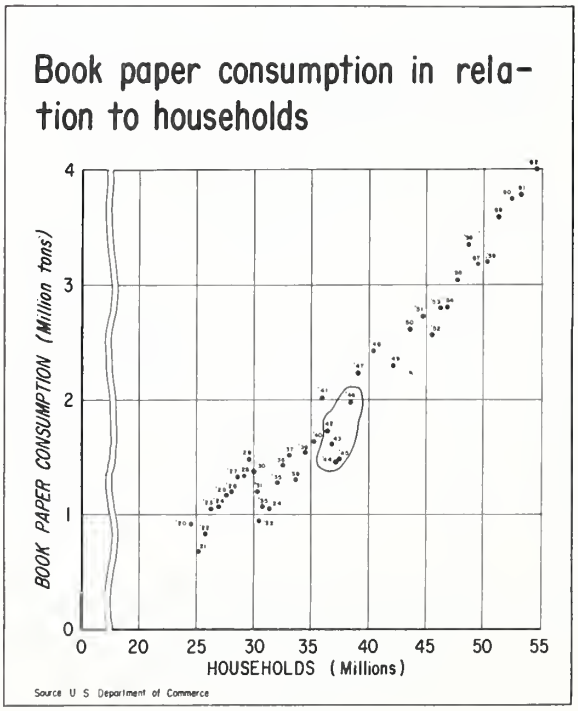


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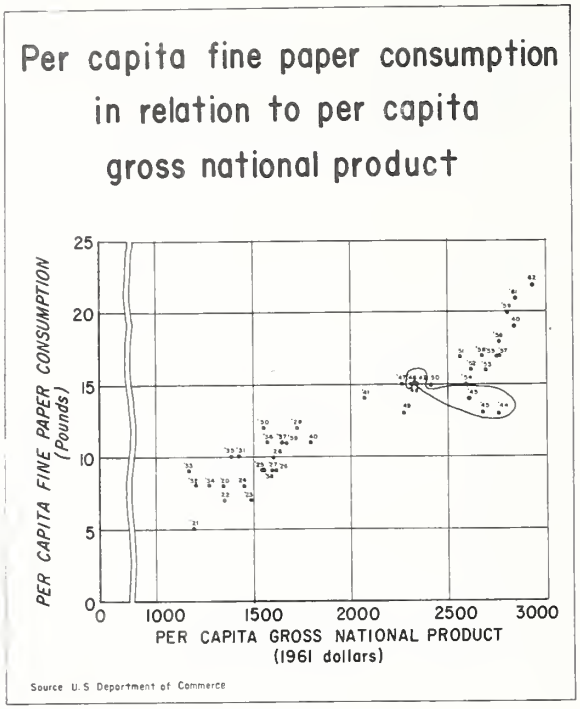


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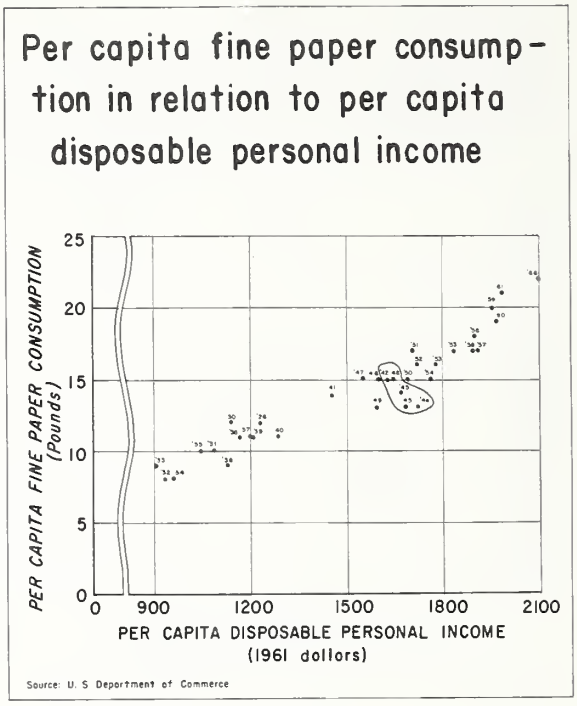



FIGURE 34

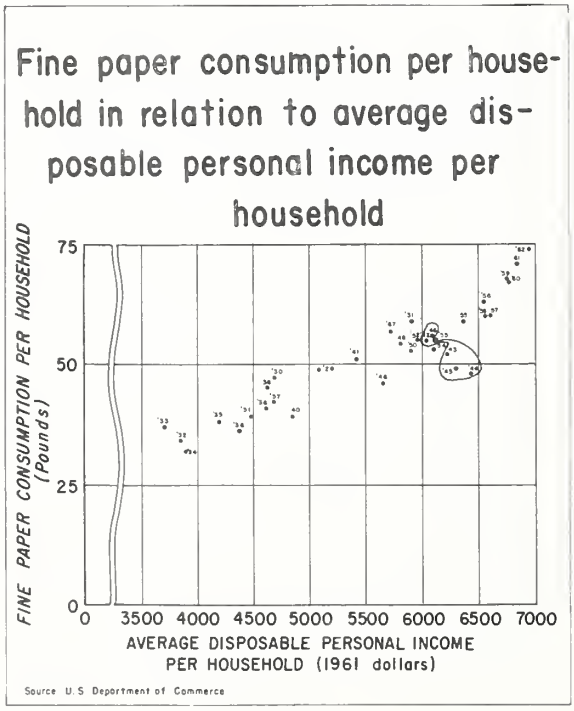
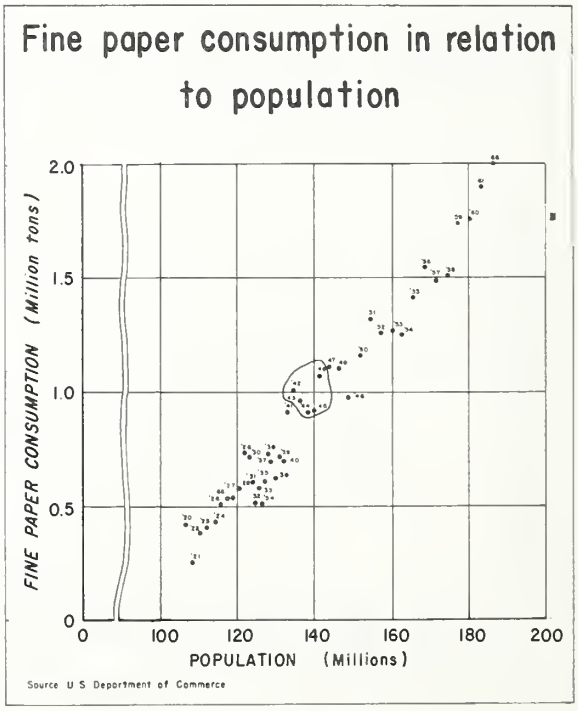



FIGURE 35

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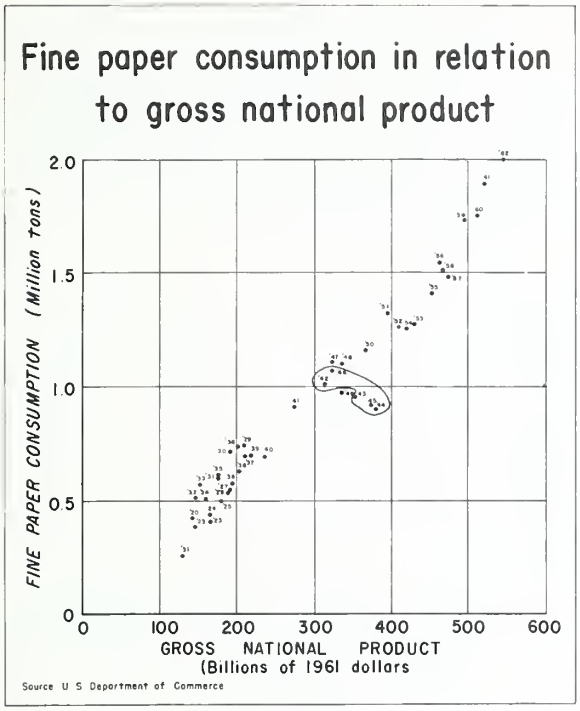
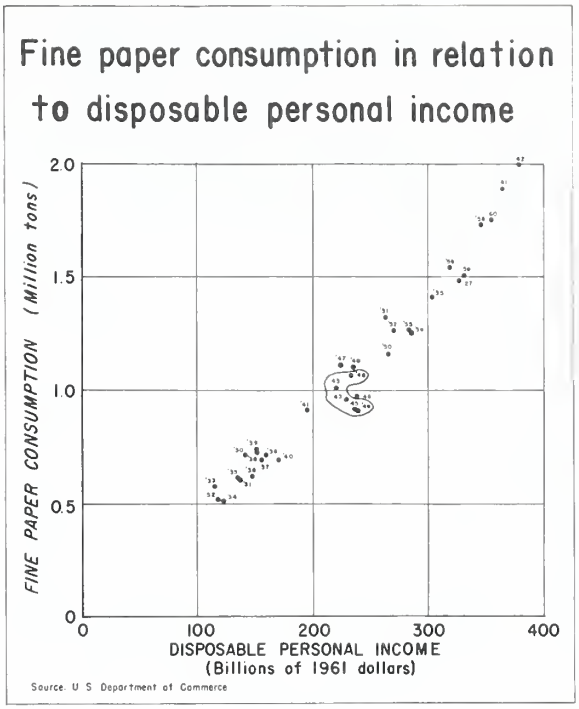



FIGURE 37

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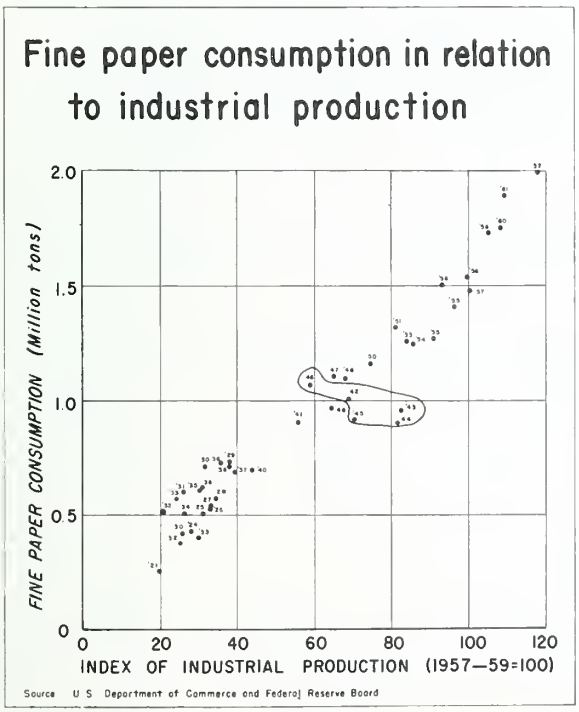
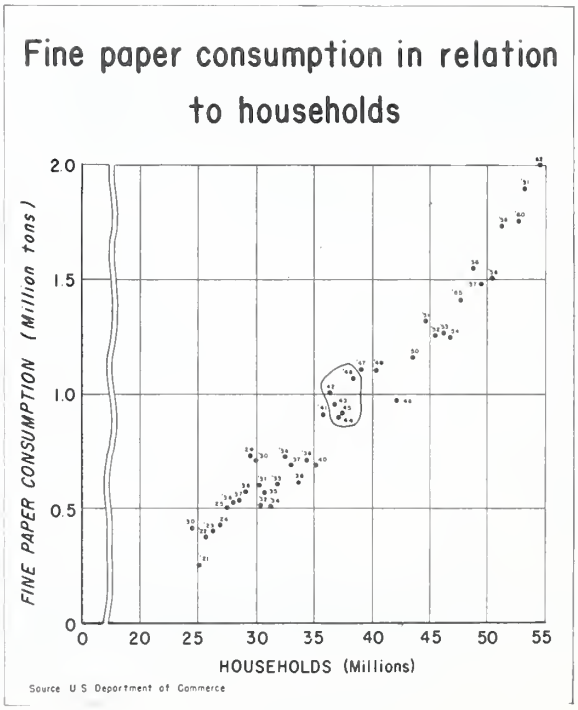



FIGURE 39

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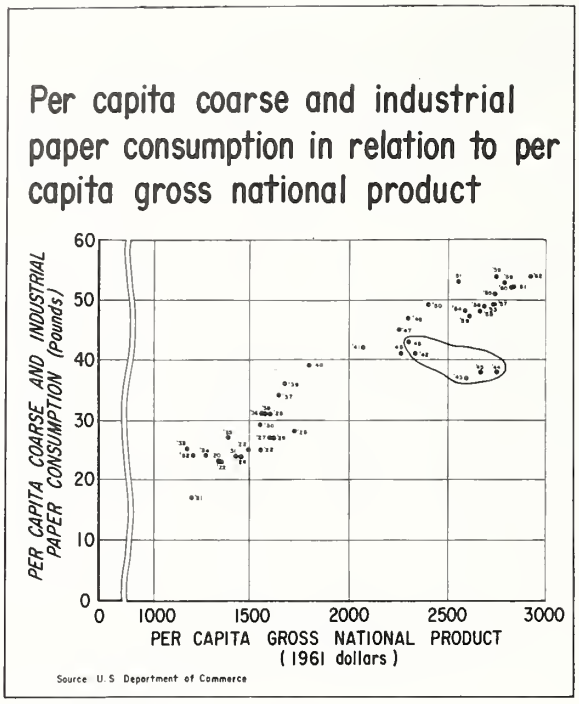


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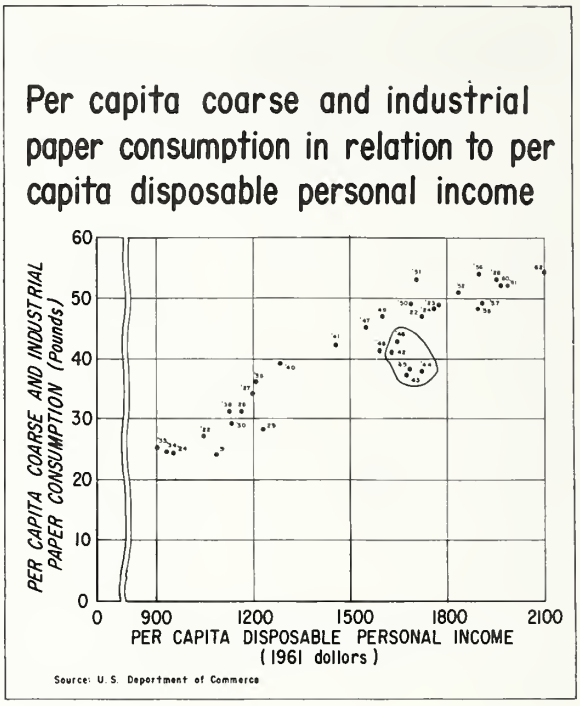


FIGURE 42

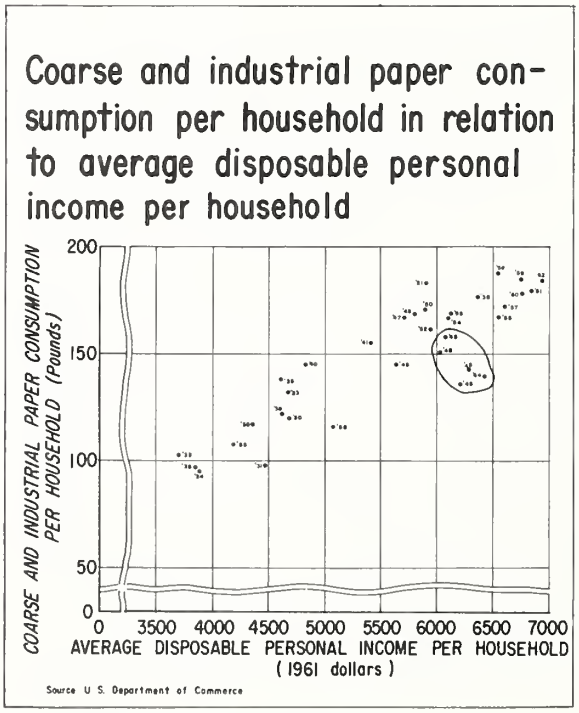


FIGURE 43

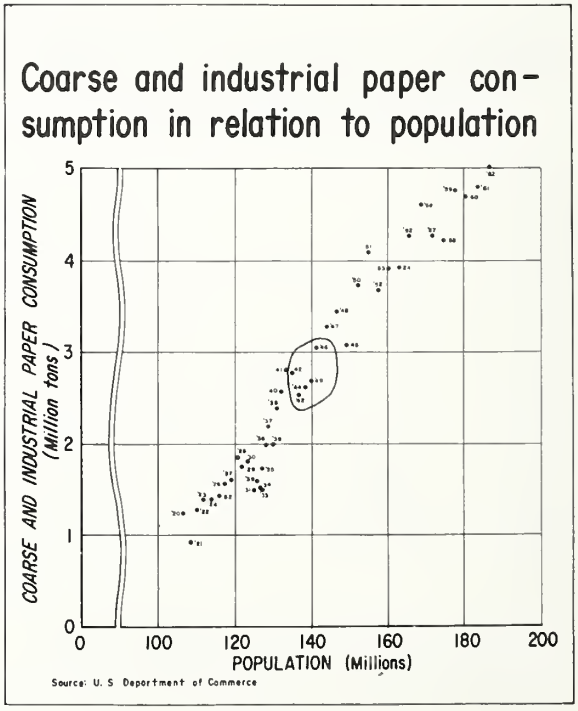


FIGURE 44

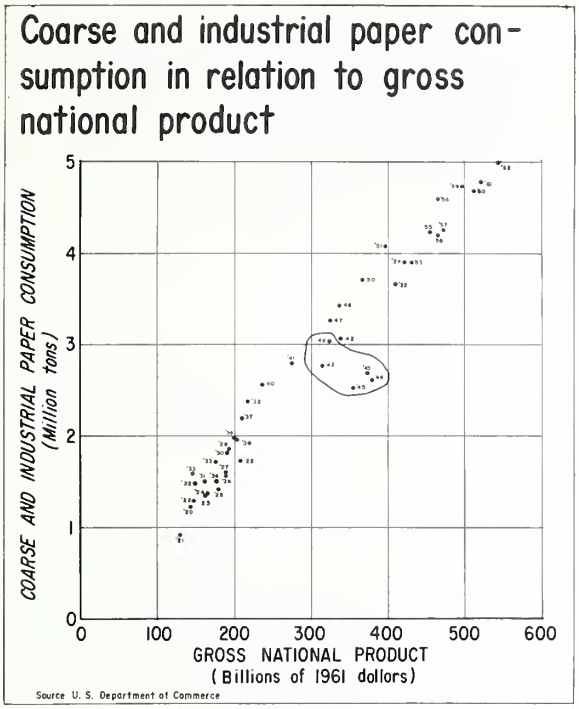


FIGURE 45

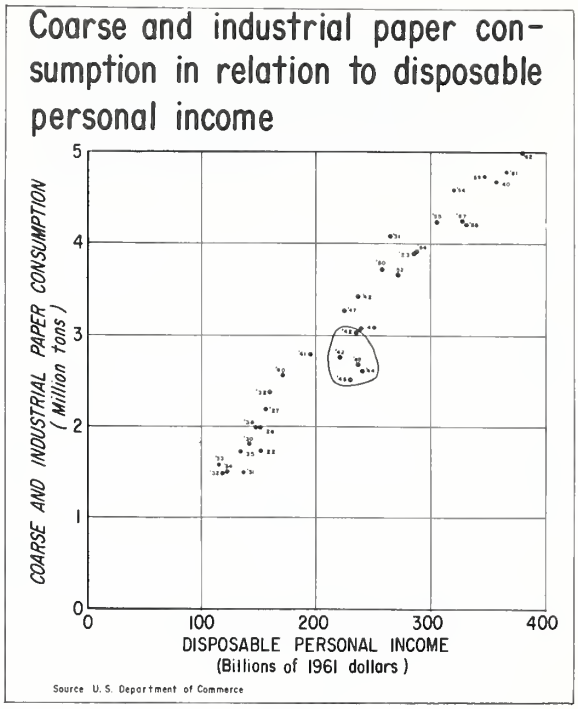


FIGURE 46

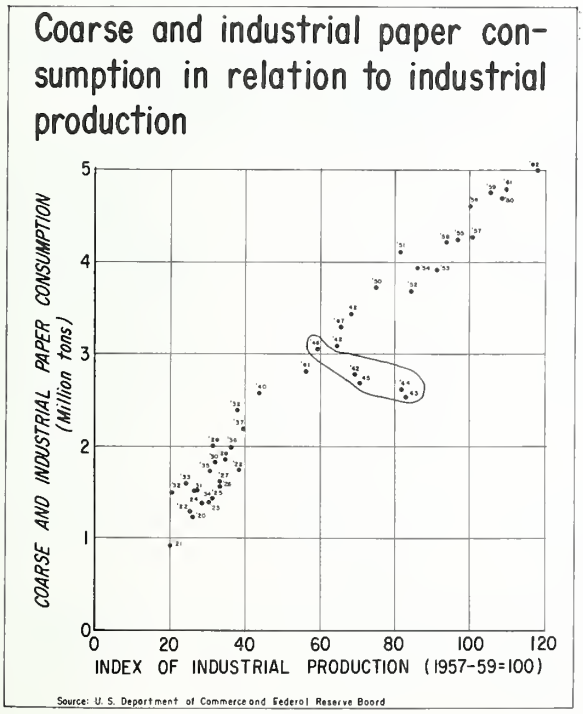


FIGURE 47

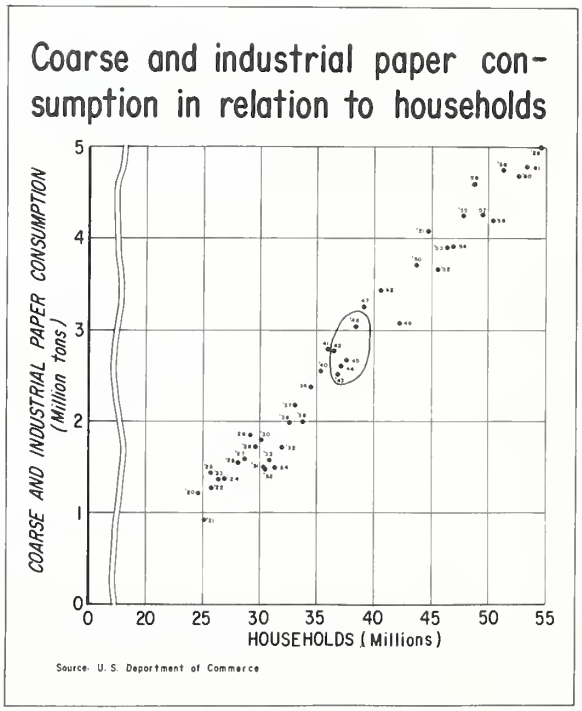


FIGURE 48

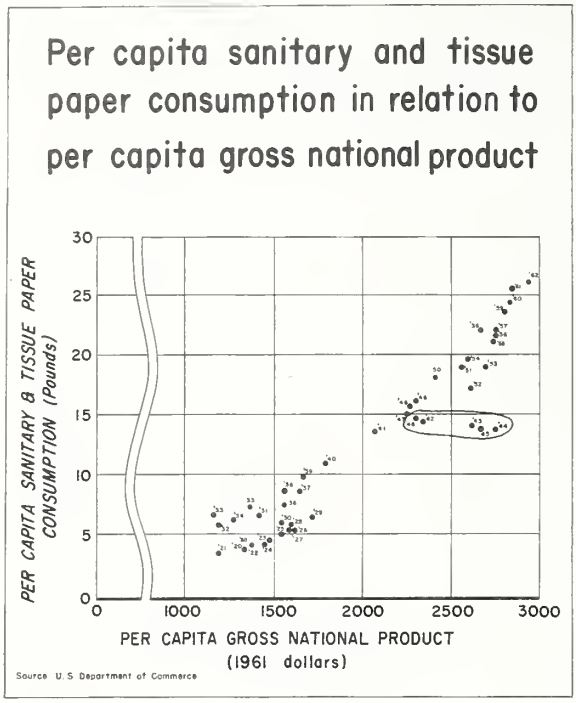


FIGURE 49

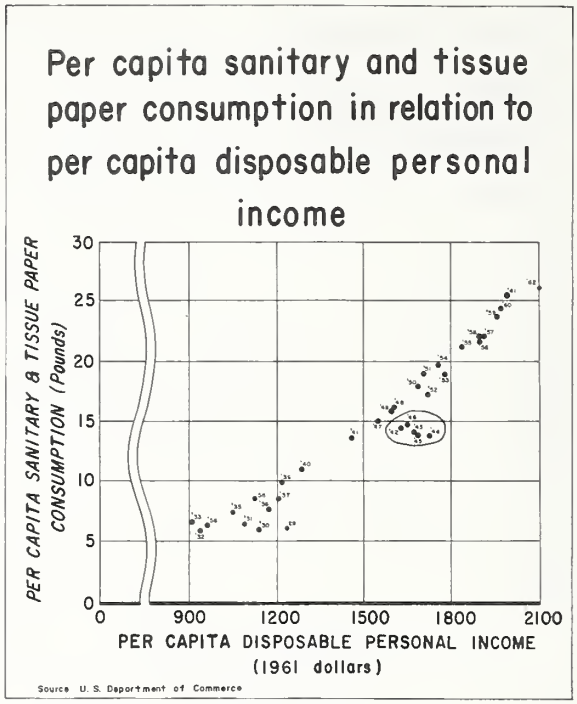


FIGURE 50

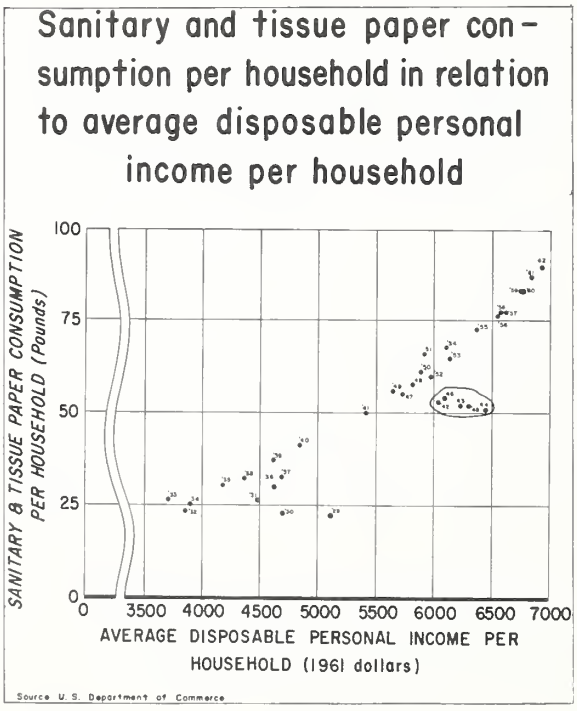


FIGURE 51

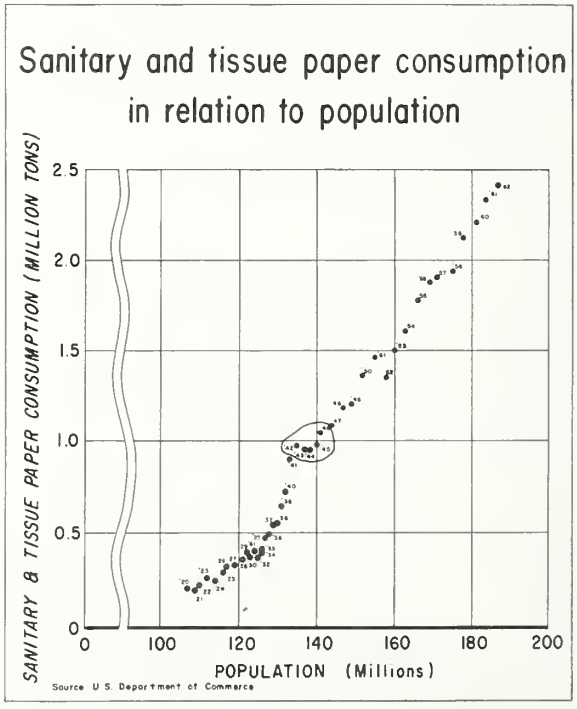


FIGURE 52

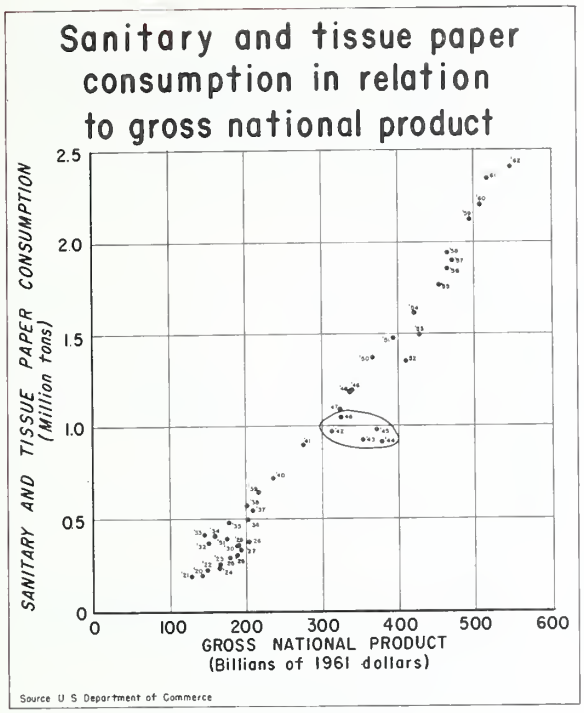


FIGURE 53

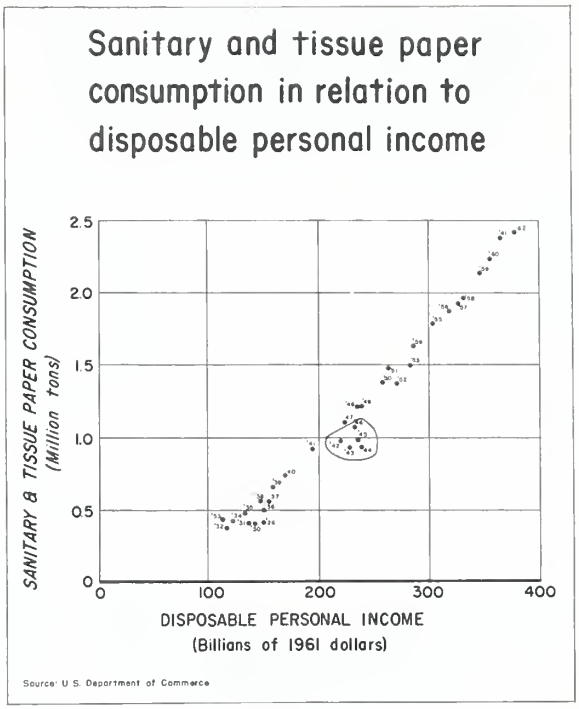


FIGURE 54

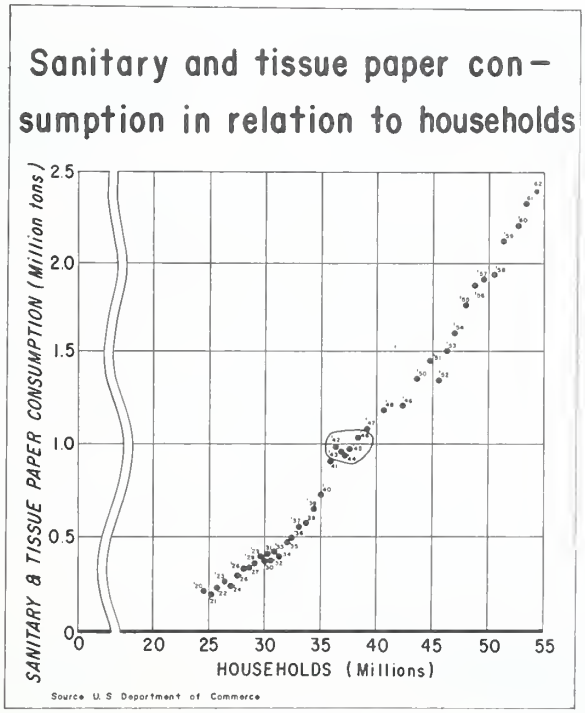


FIGURE 55

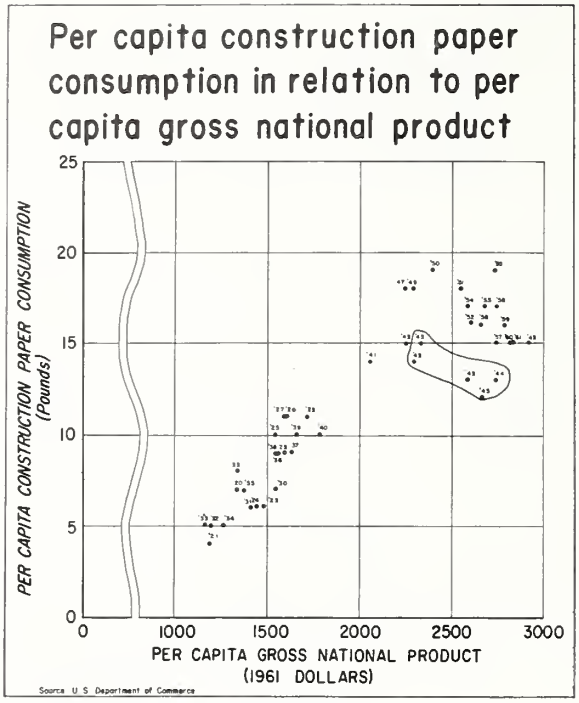


FIGURE 56

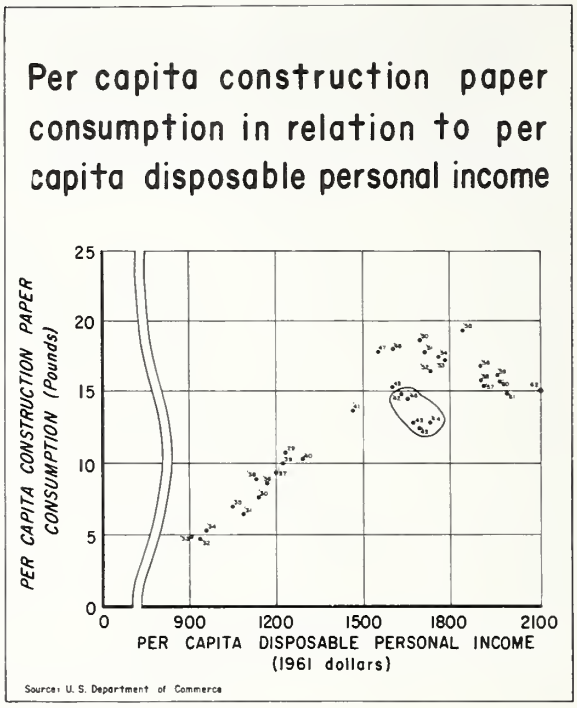


FIGURE 57

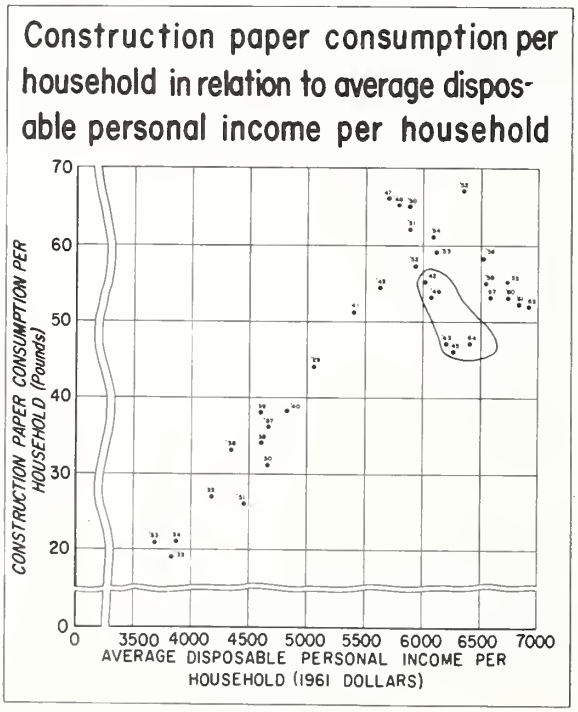


FIGURE 58

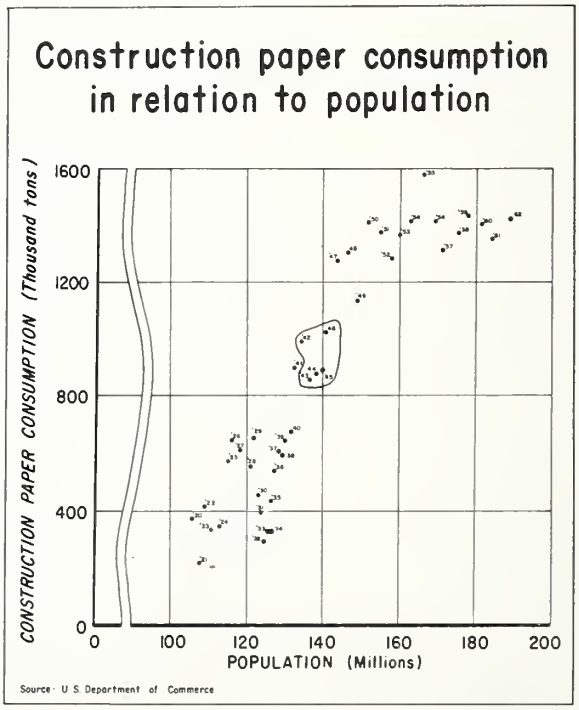


FIGURE 59

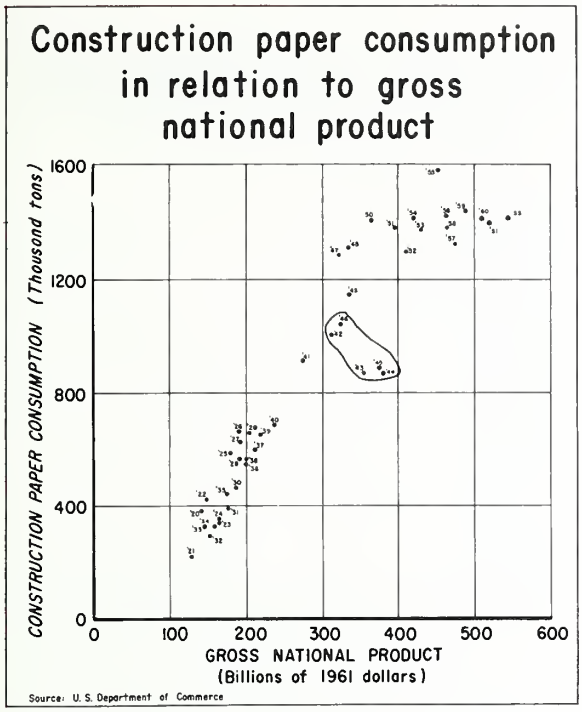


FIGURE 60

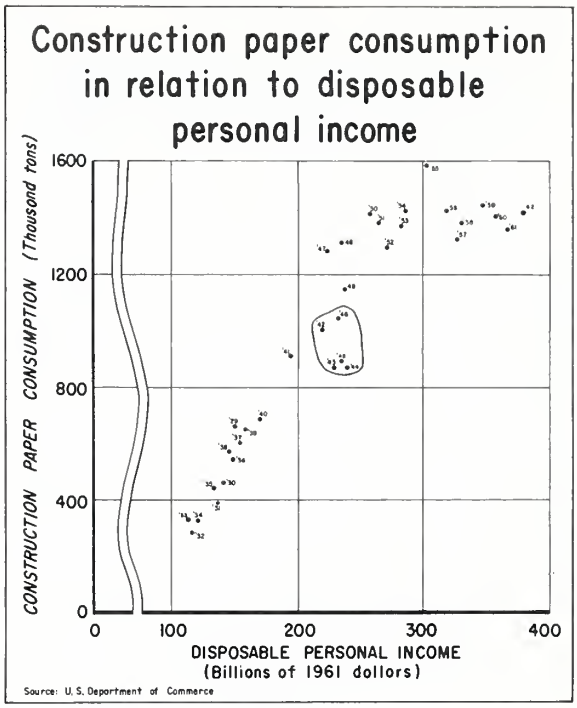


FIGURE 61

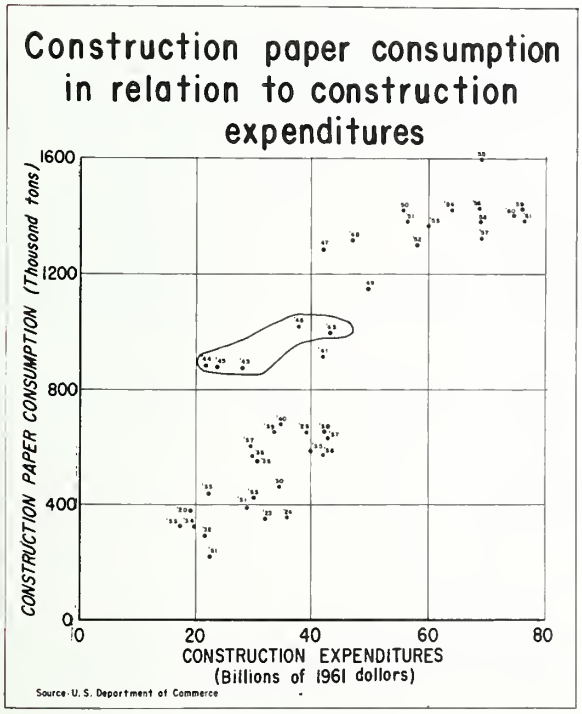


FIGURE 62

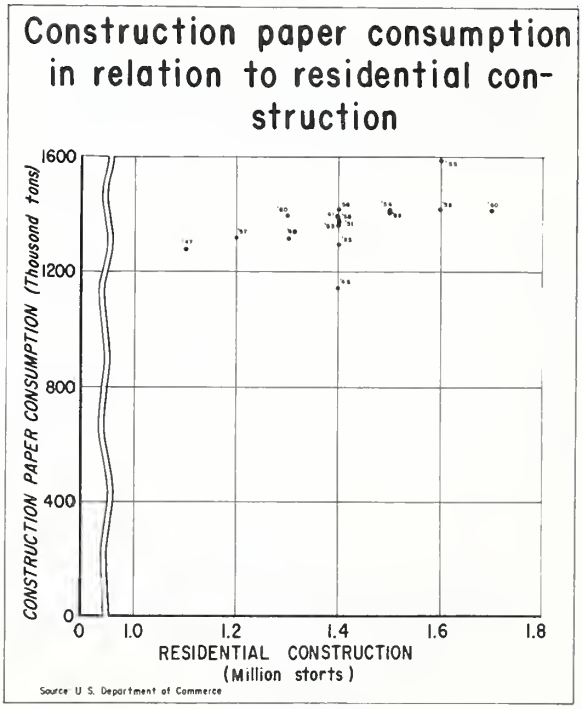


FIGURE 63

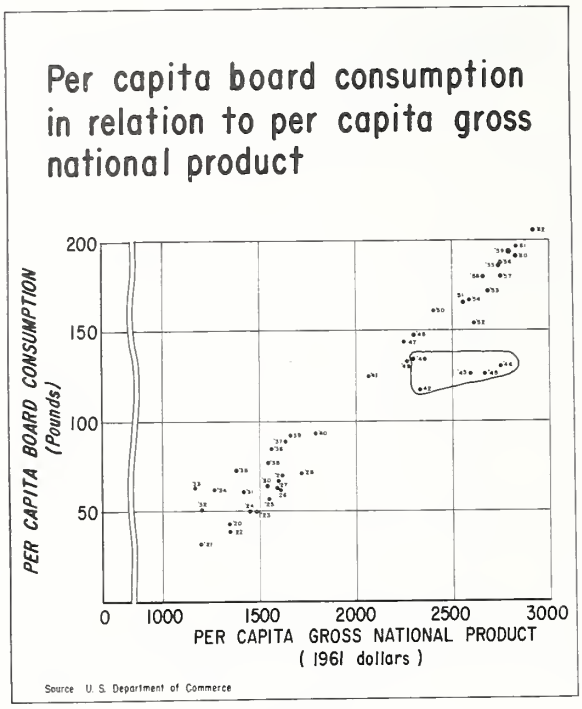


FIGURE 64

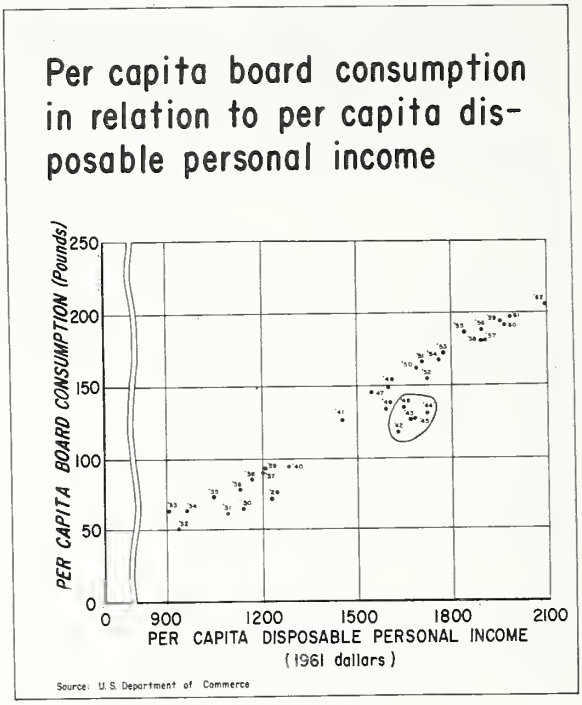


FIGURE 65

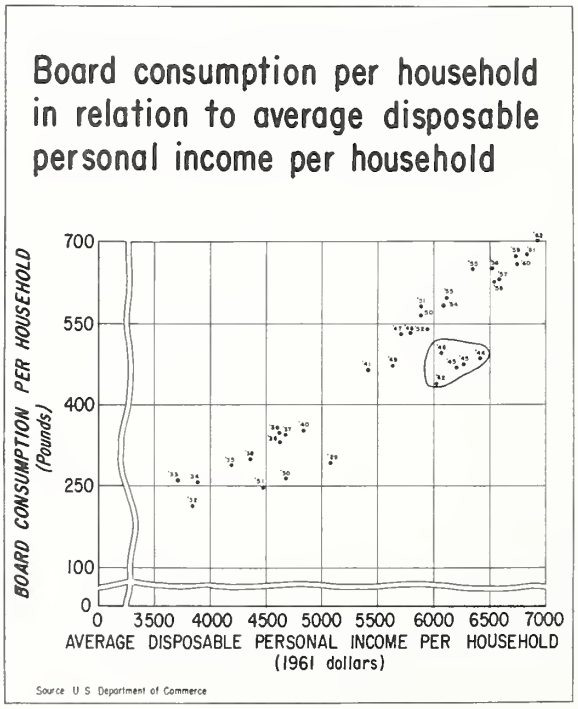


FIGURE 66

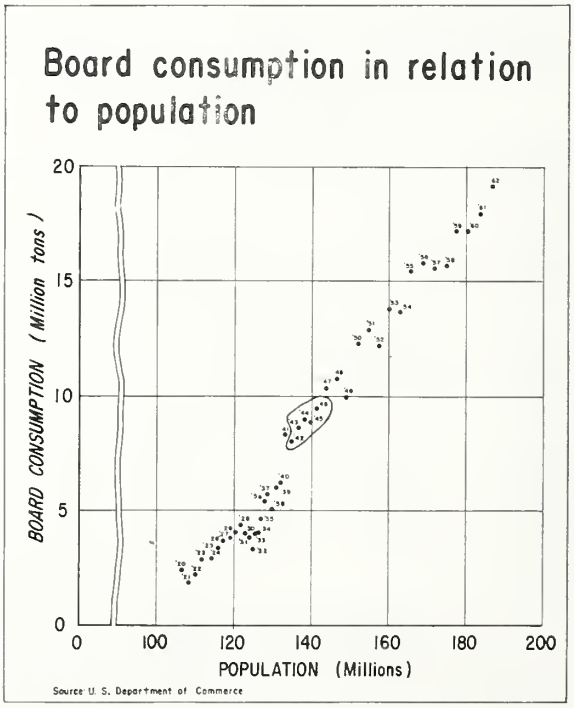


FIGURE 67

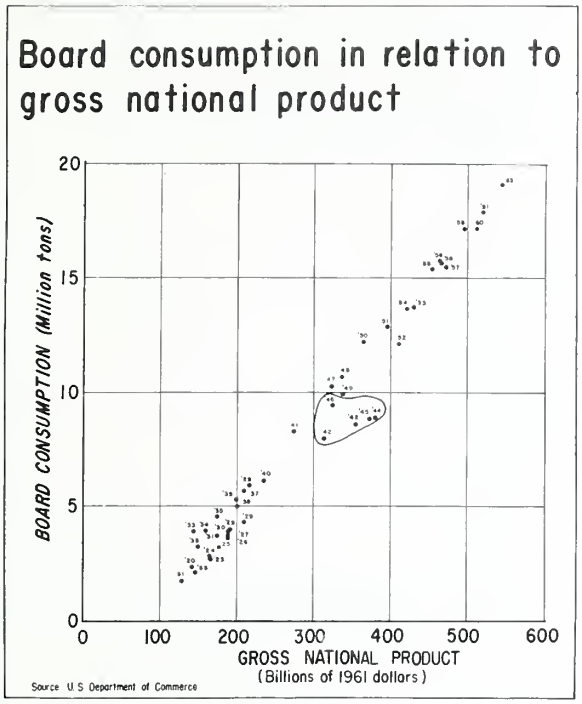


FIGURE 68

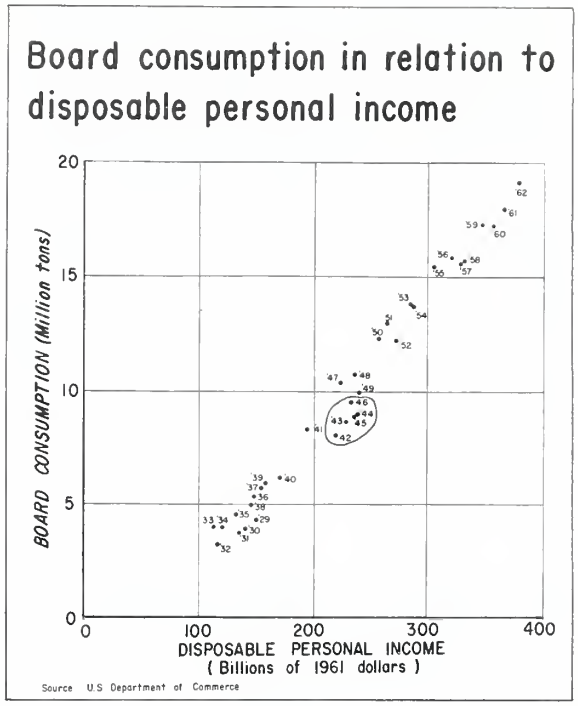


FIGURE 69

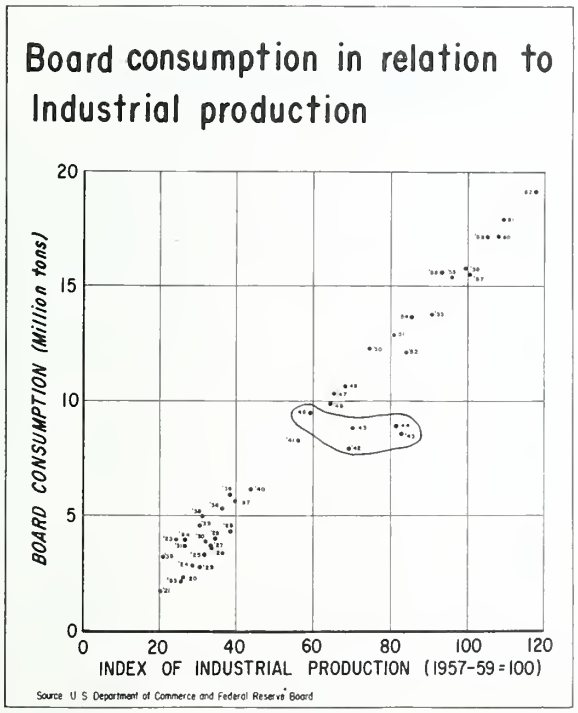


FIGURE 70

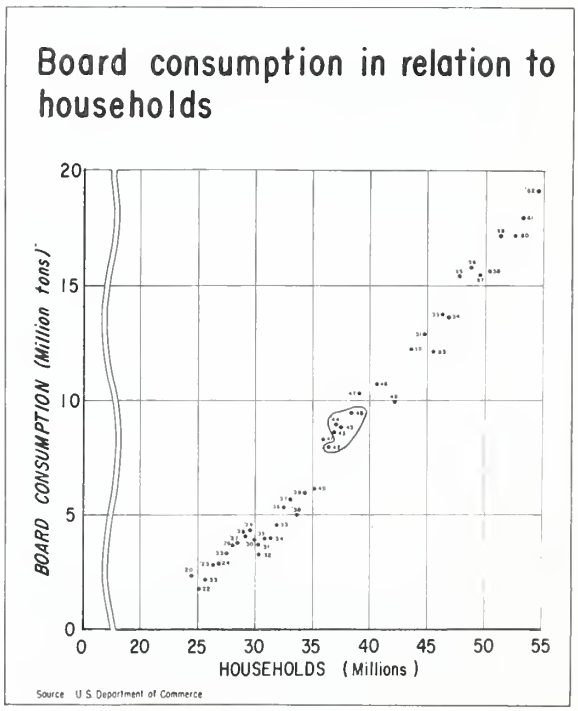


FIGURE 71

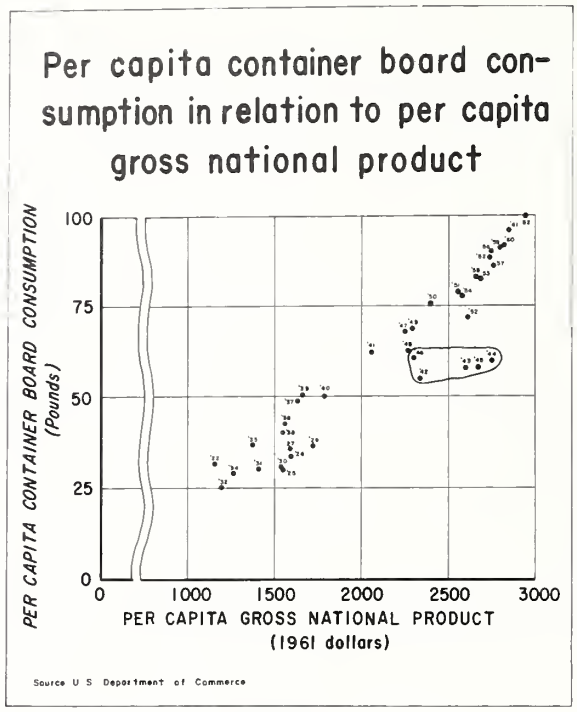


FIGURE 72

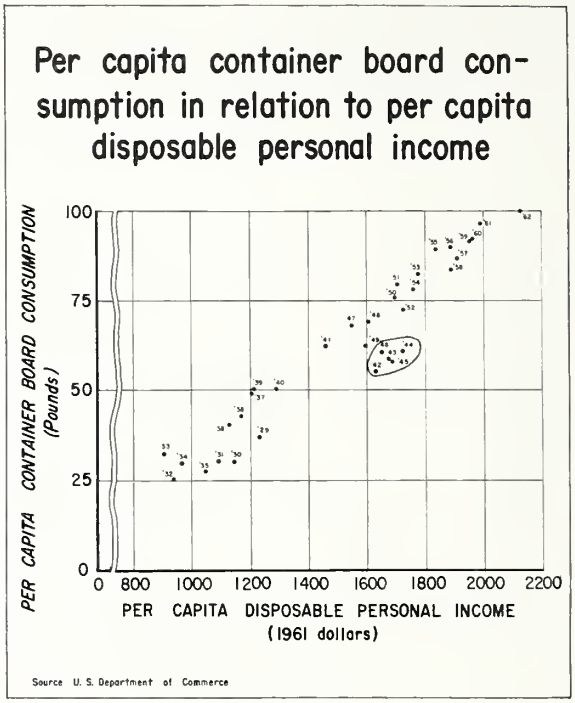


FIGURE 73

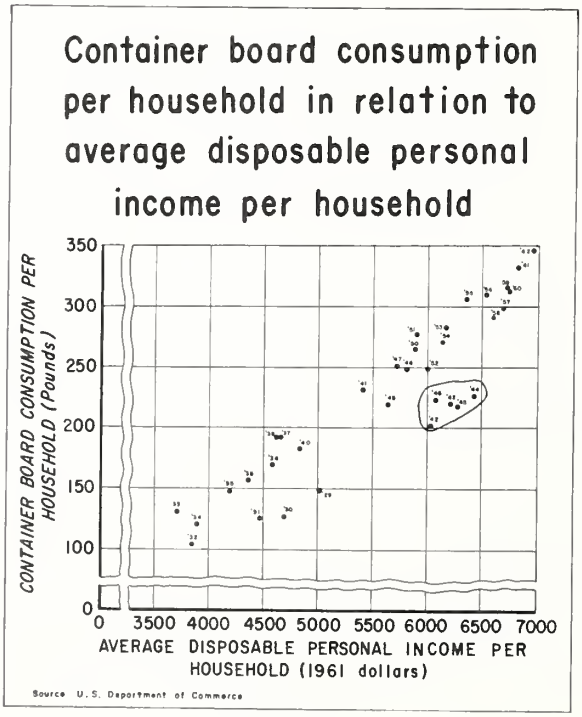


FIGURE 74

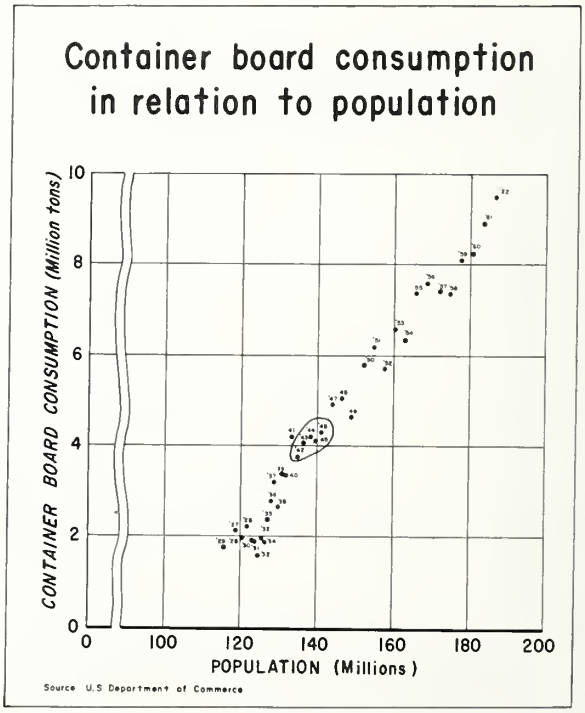


FIGURE 75

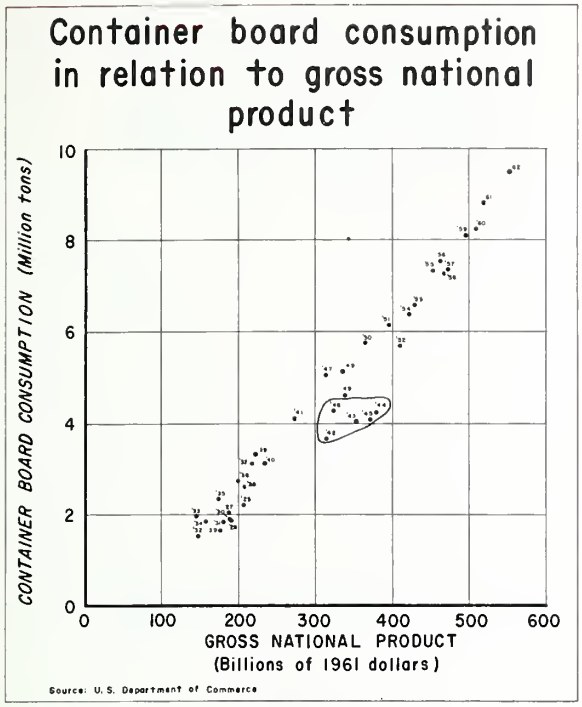


FIGURE 76

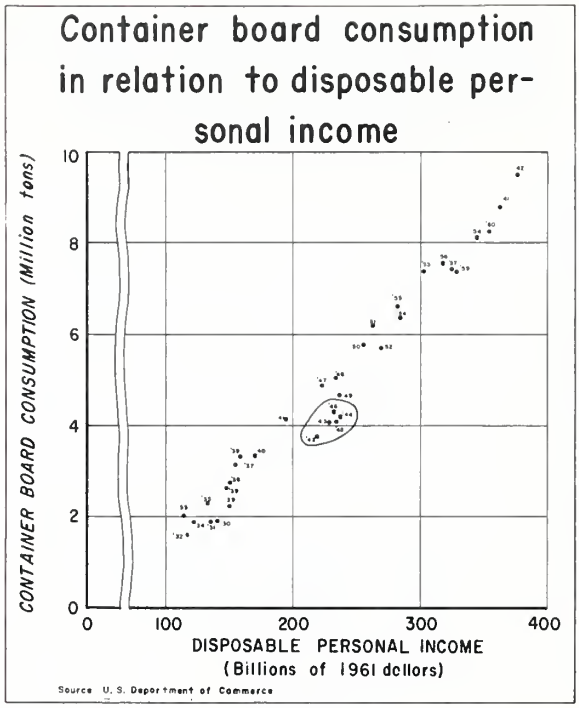


FIGURE 77

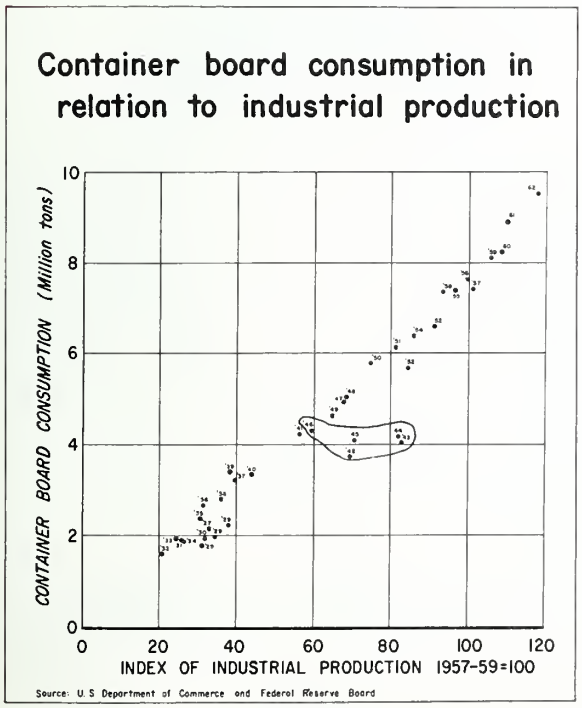


FIGURE 78

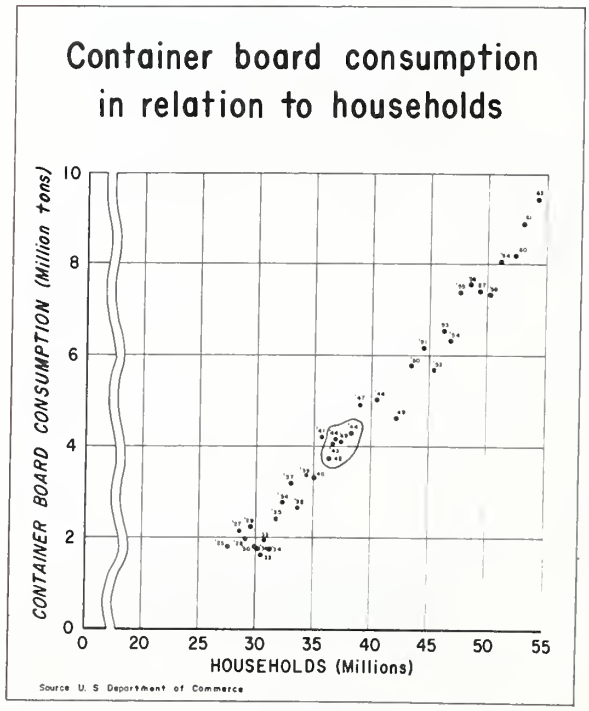


FIGURE 79

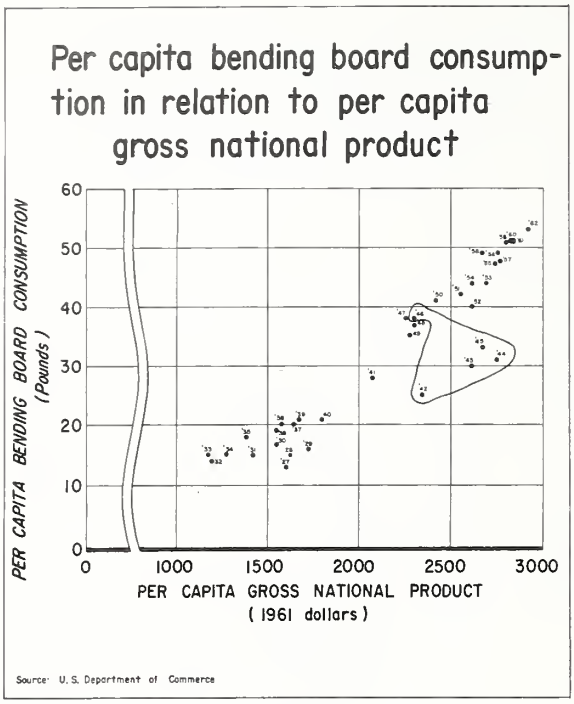


FIGURE 80

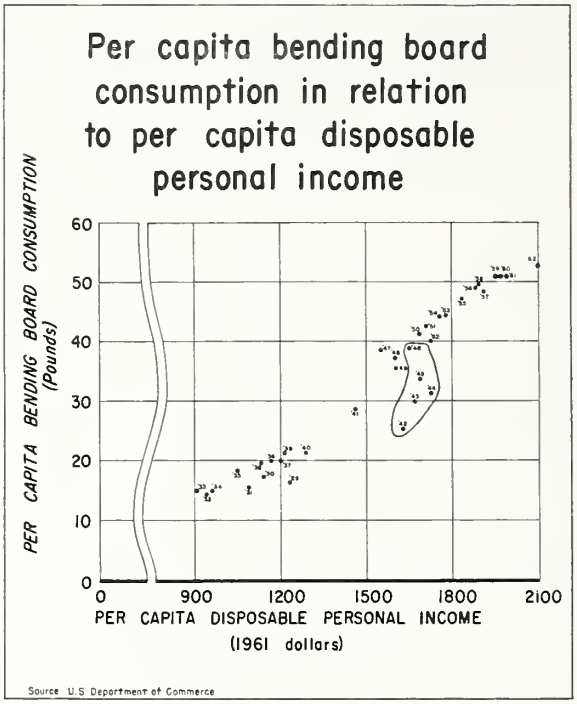


FIGURE 81

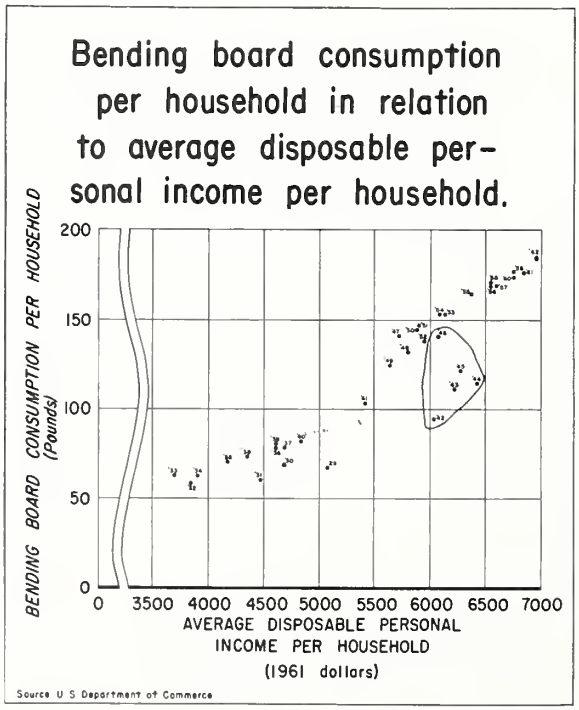


FIGURE 82

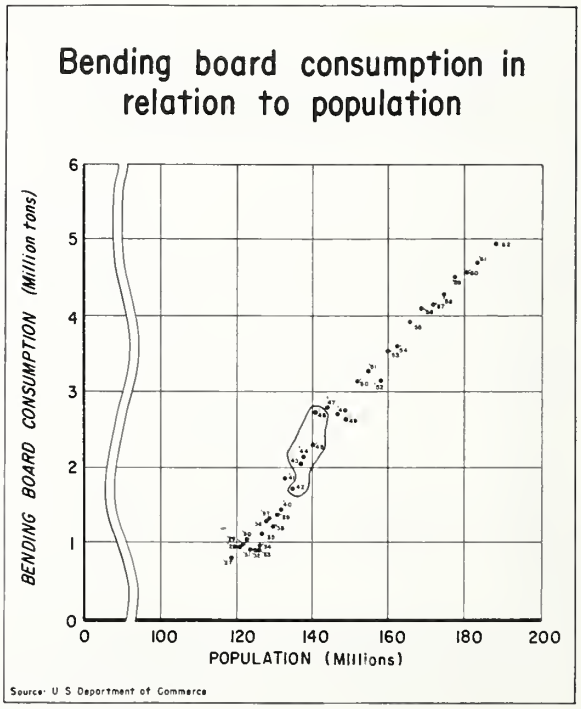


FIGURE 83

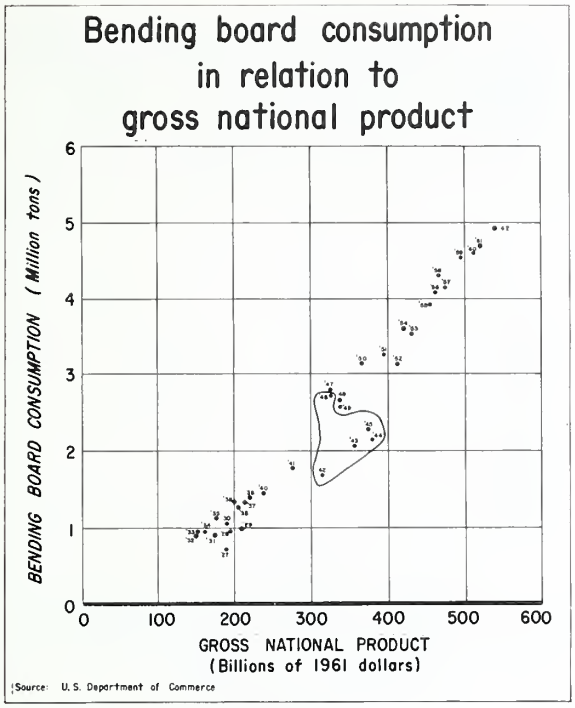


FIGURE 84

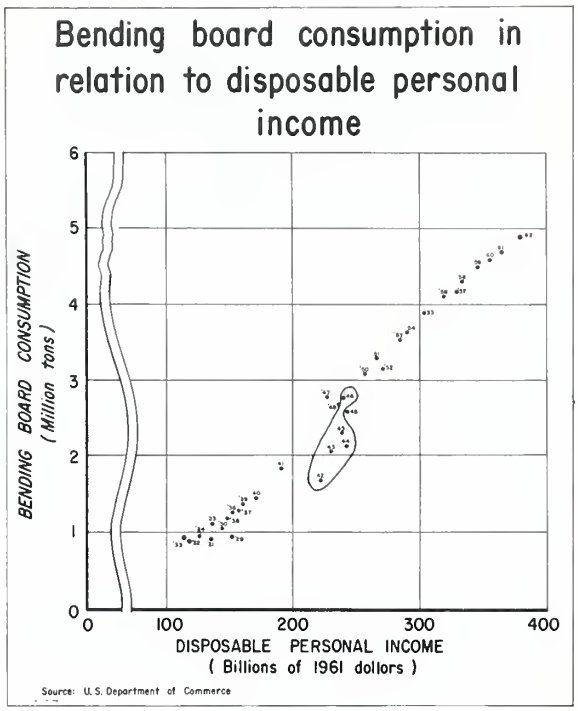


FIGURE 85

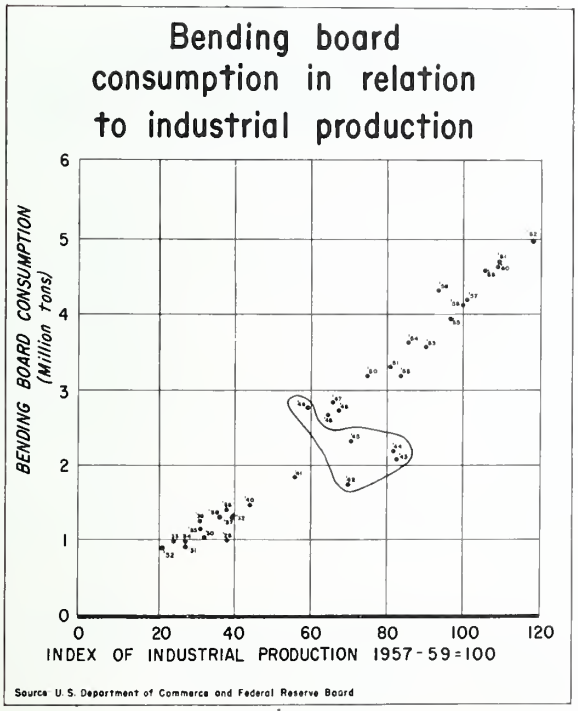


FIGURE 86

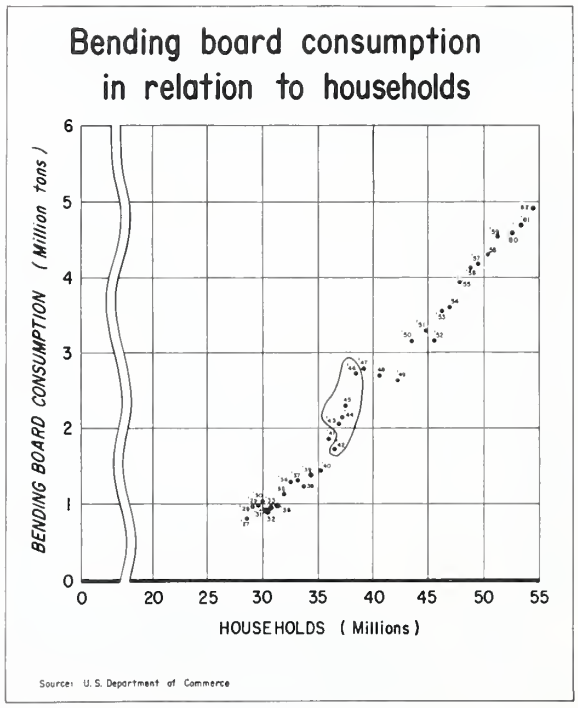


FIGURE 87

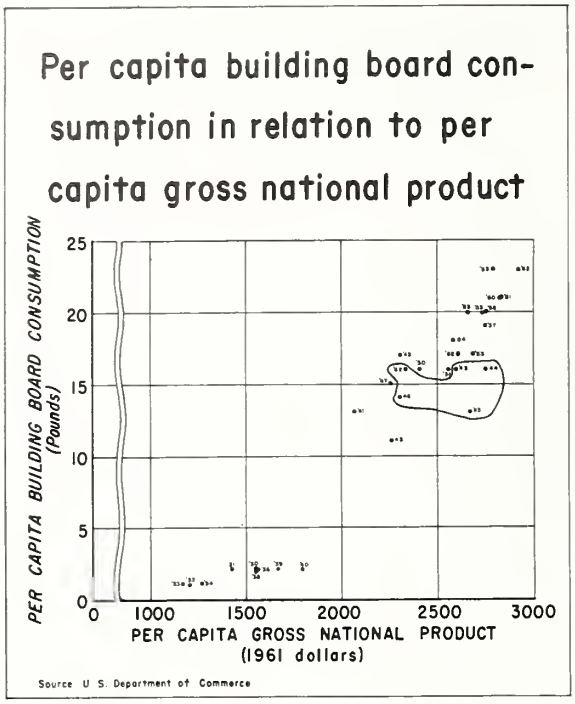


FIGURE 88

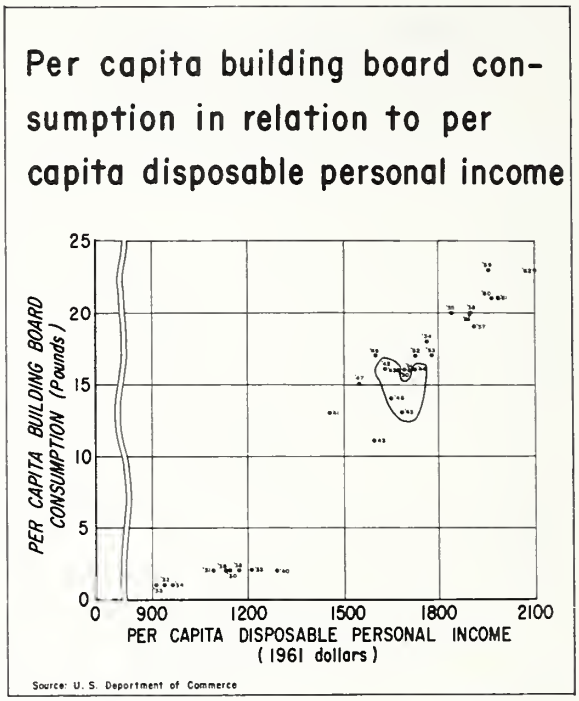


FIGURE 89

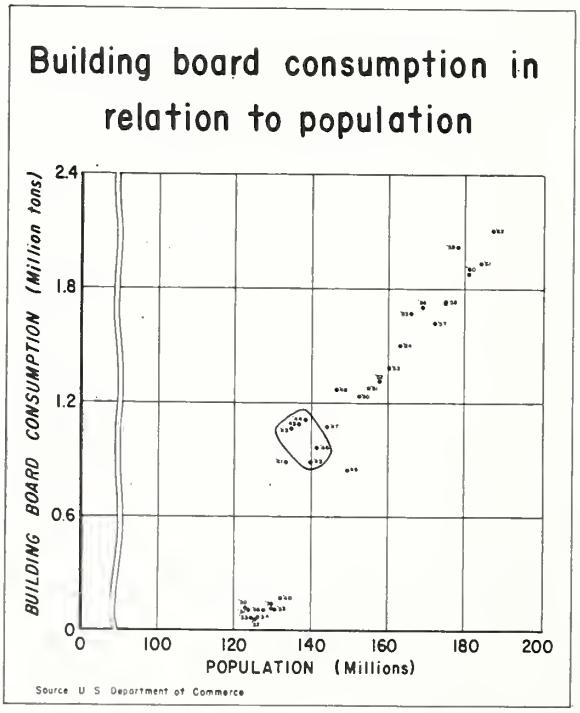


FIGURE 90

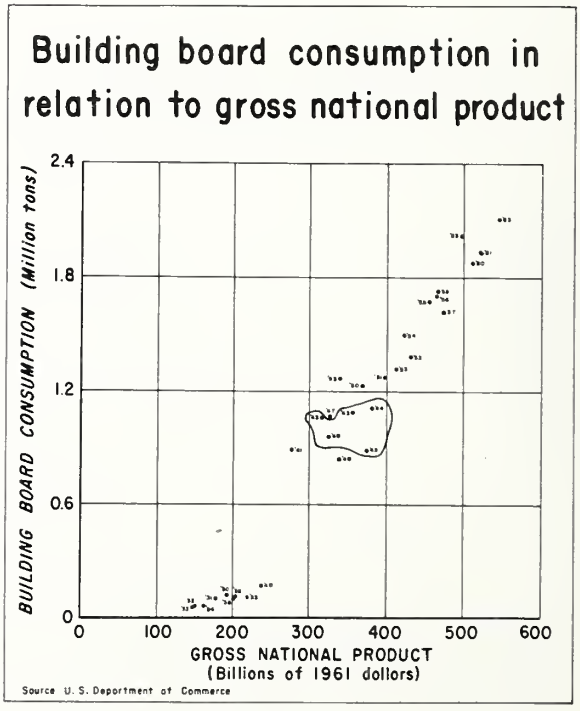


FIGURE 91

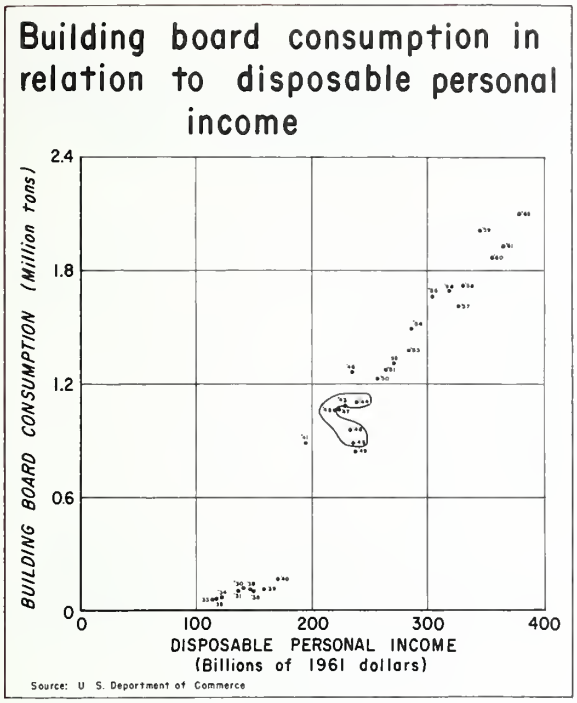


FIGURE 92

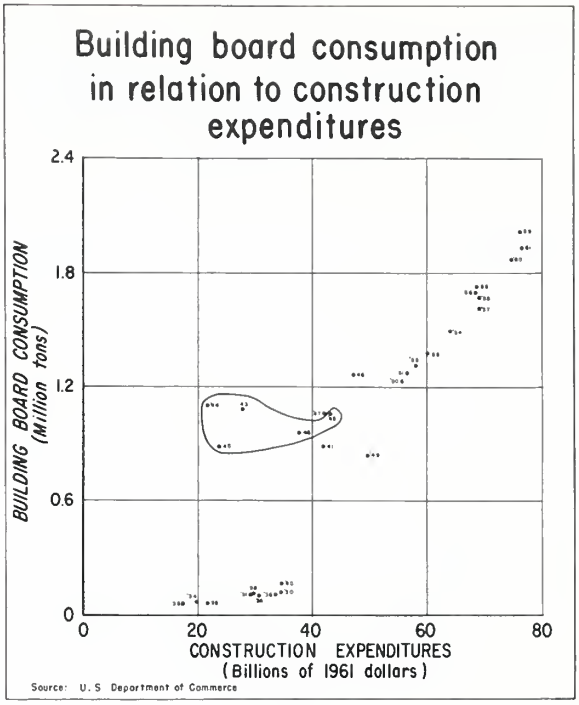


FIGURE 93

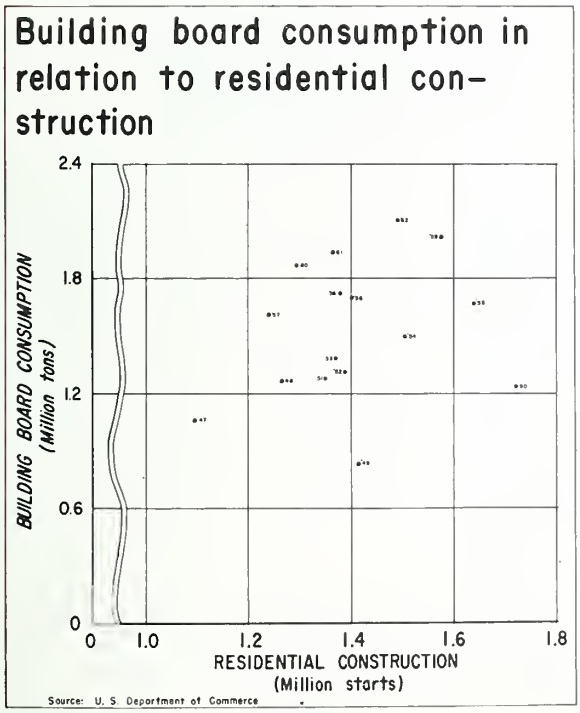


FIGURE 94

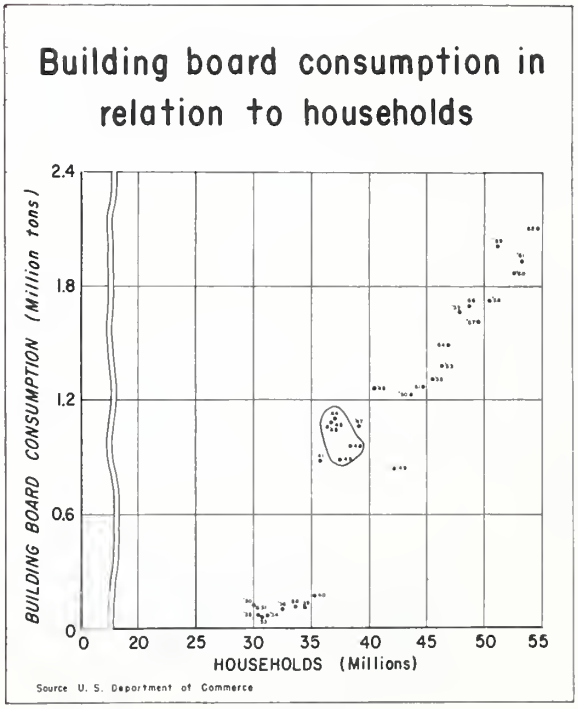


FIGURE 95

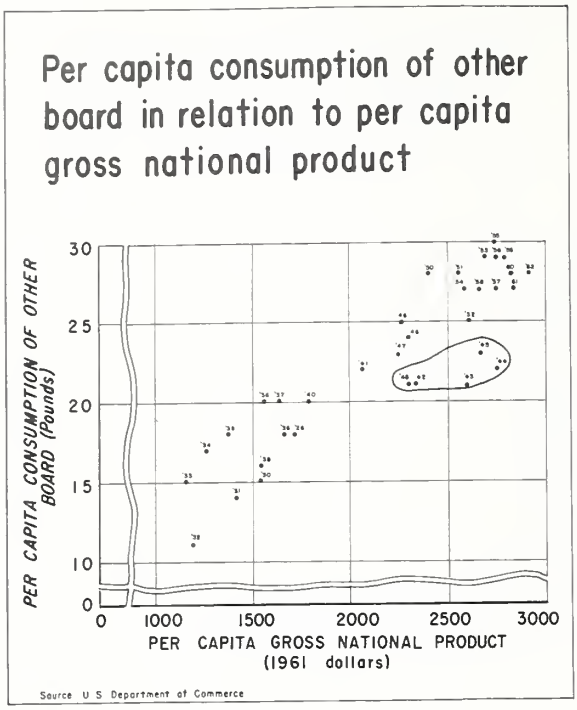


FIGURE 96

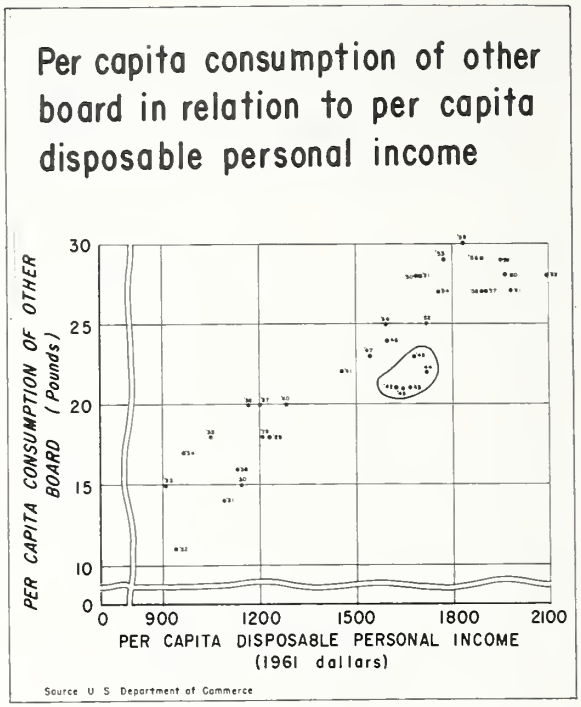


FIGURE 97

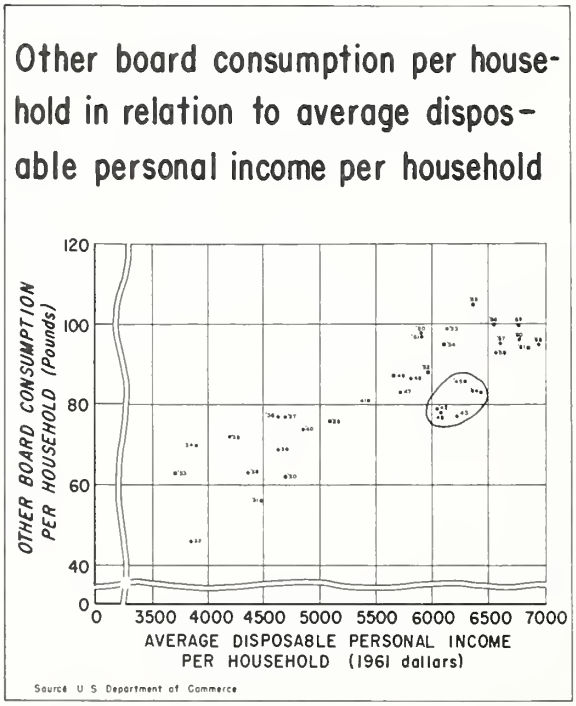


FIGURE 98

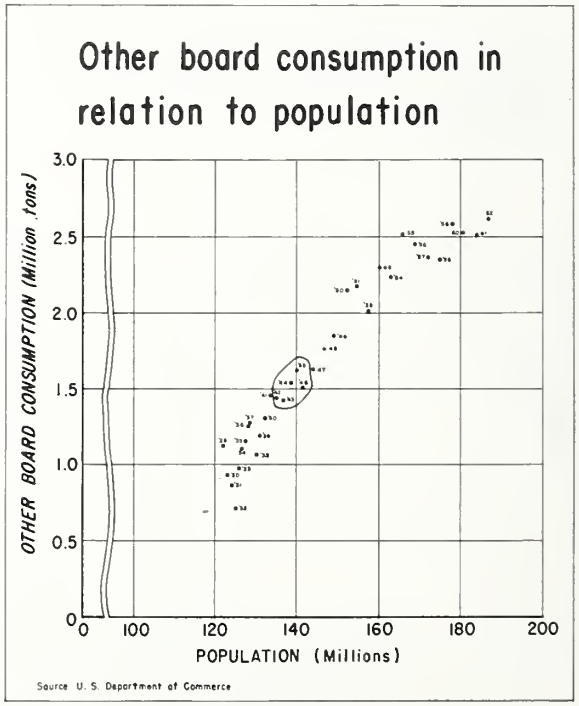


FIGURE 99

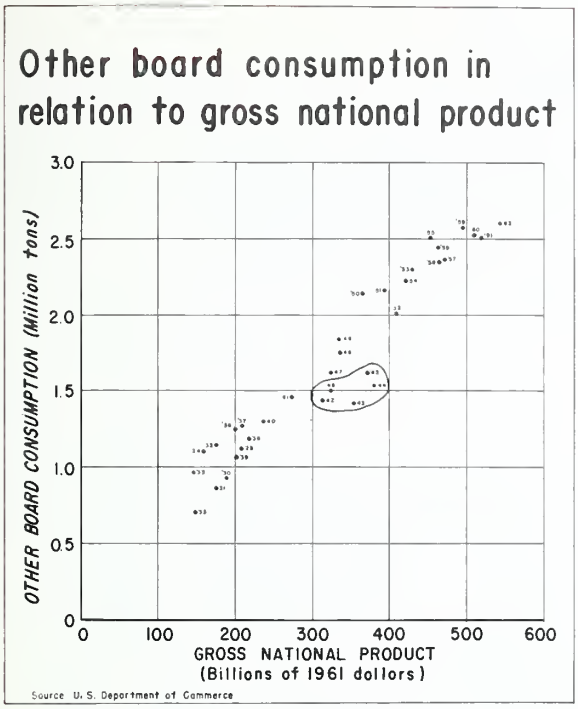


FIGURE 100

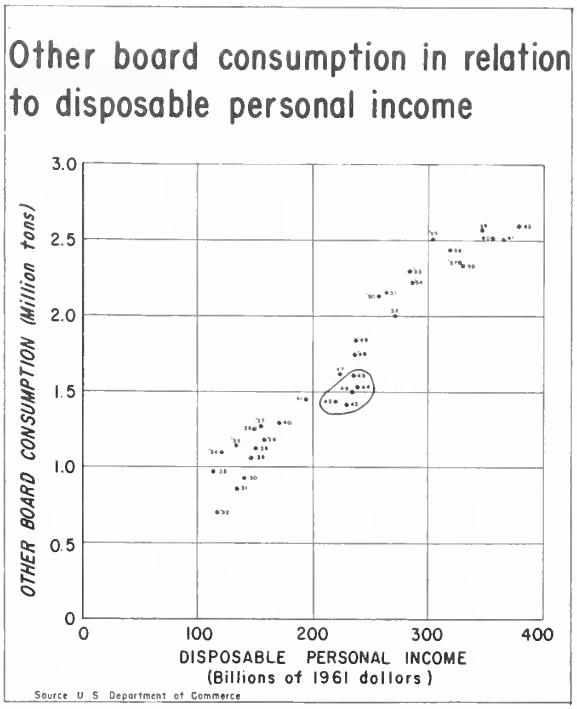


FIGURE 101

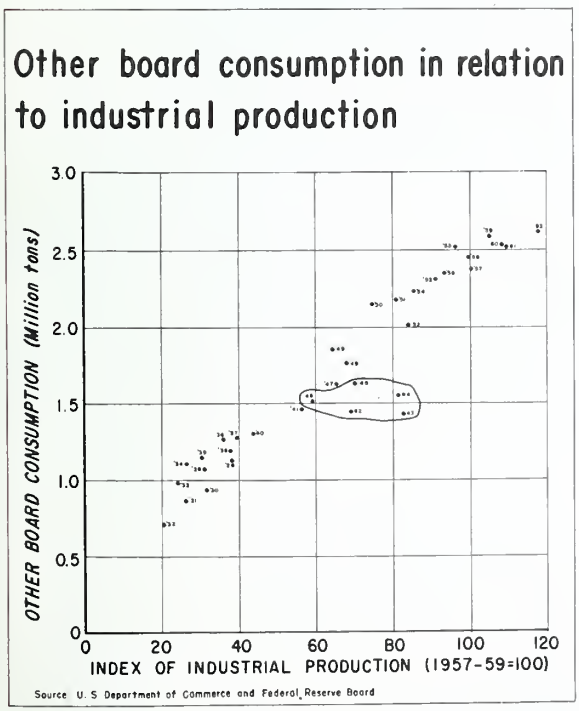


FIGURE 102

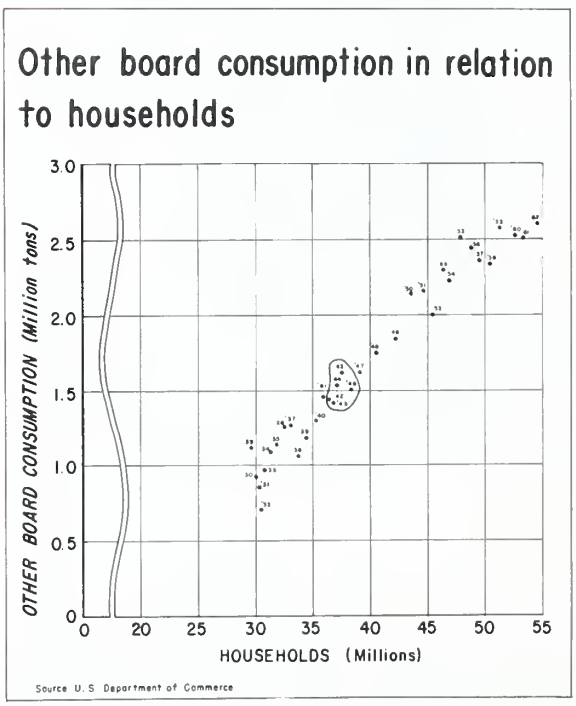


FIGURE 103

# APPENDIX B

## Regression Equations Tested for Use in Projecting Longrun Trends in Demand for Major Grades of Paper and Board

### Appendix B Contents

## *Methodology Note*

The projections of population and economic activity shown in table 4, this appendix, were used as the independent variables in making the projections of demand for paper and board shown in tables 1–15.[1] The examples below illustrate the steps in making the demand projections. In these examples, per capita newsprint demand is the dependent variable. The period 1948–63 is used as the base time period and 1985 as the projection year. Because they are somewhat different, the calculations are carried through for each of the regression equations: $Y = a + b\,X$, $Y = a + b \log X$, and $\log Y = a + b \log X$.

(a) Projected per capita newsprint demand in 1985 obtained from use of the equation $Y = a + b\,X$ where:

$Y$ = projected per capita newsprint demand in 1985.

$a$ = 46.6191. The value of the $a$ regression coefficient obtained when the equation $Y = a + b\,X$ is fitted to data showing per capita newsprint consumption and per capita gross national product in the 1948–63 period (this appendix, table 1).

$b$ = 0.0114. The value of the $b$ regression coefficient obtained when the equation $Y = a + b\,X$ is fitted to data showing per capita newsprint consumption and per capita gross national product in the 1948–63 period (this appendix, table 1).

$X$ = \$4,520. The projected per capita gross national product in 1985 (this appendix, table 4).

Using the above values:

$Y = 46.6191 + 0.0114 \bullet 4520$

$= 46.6191 + 51.5280$

= 98.1471 pounds—the projected per capita newsprint demand in 1985.

(b) Projected per capita newsprint demand in 1985 obtained from use of the equation $Y = a + b \log X$ where:

$Y$ = projected per capita newsprint demand in 1985.

$a$ = −157.8783. The value of the $a$ regression coefficient obtained when the equation $Y = a + b \log X$ is fitted to data showing per capita newsprint consumption and the logarithms of per capita gross national product in the 1948–63 period (this appendix, table 1).

$b$ = 68.6082. The value of the $b$ regression coefficient obtained when the equation $Y = a + b \log X$ is fitted to data showing per capita newsprint consumption and the logarithms of per capita gross national product in the 1948–63 period (this appendix, table 1).

$\log X$ = 3.65514. The logarithm of the projected value (\$4,520) of per capita gross national product in 1985 (this appendix, table 4).

Using the above values:

$Y = -157.8783 + 68.6082 \bullet 3.65514$

$= 250.7726 + 157.8783$

= 92.8943 pounds—the projected per capita newsprint demand in 1985.

(c) Projected per capita newsprint demand in 1985 obtained from use of the equation $\log Y = a + b \log X$ where:

$\log Y$ = the logarithm of projected per capita newsprint demand in 1985.

$a$ = 0.5446. The value of the $a$ regression coefficient obtained when the equation $\log Y = a + b \log X$ is fitted to the logarithms of per capita newsprint consumption and per capita gross national product in the 1948–63 period (this appendix, table 1).

$b$ = 0.3919. The value of the $b$ regression coefficient obtained when the equation $\log Y = a + b \log X$ is fitted to the logarithms of per capita newsprint consumption and per capita gross national product in the 1948–63 period (this appendix, table 1).

$\log X$ = 3.65514. The logarithm of the projected value (\$4,520) of per capita gross national product in 1985 (this appendix, table 4).

Using the above values:

$\log Y = 0.5446 + 0.3919 \bullet 3.65514$

$= 0.5446 + 1.4324 = 1.9770$

the antilog of 1.977 = 94.84 pounds—the projected per capita newsprint demand in 1985.

The projection of total newsprint consumption in tons, for each of the above equations, was derived by multiplying the projected per capita consumption in pounds by projected population (this appendix table 4) and dividing by 2,000 (the conversion from pounds to tons).

The $a$ and $b$ coefficients shown above and in the following tables can be used with any given projection of population, gross national product, or the other related measures of economic activity. *It should be noted that common logarithms have been used in all the simple regression equations and natural logarithms in the multiple regression equations.*

[1] Revised and higher projections of population and economic activity (text table 8) were used in making the projections of demand for paper and board adopted in this study (text tables 9 and 10).

TABLE 1.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| Per capita newsprint consumption as a function of per capita disposable personal income | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b X$ | 16.7233 | 0.0330 | -- | 2.9352 | 0.0016 | -- |
| $Y = a + b \log X$ [7] | −274.3888 | 107.6945 | -- | 2.8007 | 4.8362 | -- |
| $\log Y = a + b \log X$ [7] | −0.5428 | .7450 | -- | 0.0197 | .0340 | -- |
| 1947–61 | | | | | | |
| $Y = a + b X$ | 31.6544 | .0248 | -- | 2.5787 | .0048 | -- |
| $Y = a + b \log X$ [7] | −256.7431 | 102.3751 | -- | 2.5196 | 19.0680 | -- |
| $\log Y = a + b \log X$ [7] | .0742 | .6013 | -- | .0153 | .1158 | -- |
| 1948–62 | | | | | | |
| $Y = a + b X$ | 47.4514 | .0161 | -- | 1.9922 | .0035 | -- |
| $Y = a + b \log X$ [7] | −146.7357 | 68.6058 | -- | 1.9620 | 14.5187 | -- |
| $\log Y = a + b \log X$ [7] | .6138 | .3902 | -- | .0113 | .0834 | -- |
| Per capita newsprint consumption as a function of per capita gross national product | | | | | | |
| 1920–61 [6] | | | | | | |
| $Y = a + b X$ | 19.3011 | .0219 | -- | 3.6131 | .0010 | -- |
| $Y = a + b \log X$ [7] | −260.5173 | 98.5870 | -- | 3.3399 | 4.2709 | -- |
| $\log Y = a + b \log X$ [7] | −.5235 | .7049 | -- | .0285 | .0364 | -- |
| 1947–61 | | | | | | |
| $Y = a + b X$ | 30.1987 | .0177 | -- | 2.5329 | .0033 | -- |
| $Y = a + b \log X$ [7] | −275.3463 | 102.9577 | -- | 2.5291 | 19.2818 | -- |
| $\log Y = a + b \log X$ [7] | −.1881 | .6061 | -- | .0153 | .1165 | -- |
| 1947–62 | | | | | | |
| $Y = a + b X$ | 32.4589 | .0167 | -- | 2.4364 | .0030 | -- |
| $Y = a + b \log X$ [7] | −259.3133 | 98.1936 | -- | 2.4272 | 17.3582 | -- |
| $\log Y = a + b \log X$ [7] | −.0873 | .5762 | -- | .0146 | .1042 | -- |
| 1947–63 | | | | | | |
| $Y = a + b X$ | 36.9026 | .0149 | -- | 2.5131 | .0028 | -- |
| $Y = a + b \log X$ [7] | −230.0046 | 89.5679 | -- | 2.4716 | 16.2112 | -- |
| $\log Y = a + b \log X$ [7] | .0854 | .5253 | -- | .0148 | .0971 | -- |
| 1948–61 | | | | | | |
| $Y = a + b X$ | 41.8569 | .0133 | -- | 1.9841 | .0030 | -- |
| $Y = a + b \log X$ [7] | −186.9908 | 77.1619 | -- | 2.0139 | 17.6312 | -- |
| $\log Y = a + b \log X$ [7] | .3766 | .4412 | -- | .0115 | .1006 | -- |
| 1948–62 | | | | | | |
| $Y = a + b X$ | 42.8157 | .0129 | -- | 1.9147 | .0026 | -- |
| $Y = a + b \log X$ [7] | −182.5102 | 75.8437 | -- | 1.9382 | 15.7450 | -- |
| $\log Y = a + b \log X$ [7] | .4045 | .4330 | -- | .0111 | .0898 | -- |
| 1948–63 | | | | | | |
| $Y = a + b X$ | 46.6191 | .0114 | -- | 1.9570 | .0024 | -- |
| $Y = a + b \log X$ [7] | −157.8783 | 68.6082 | -- | 1.9529 | 14.4180 | -- |
| $\log Y = a + b \log X$ [7] | .5446 | .3919 | -- | .0111 | .0822 | -- |

See footnotes at end of table.

*for use in projecting demand for newsprint.*

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| 0.972 | 0.945 | 26 | 21.2 | 9,976 | 95.92 | 11,541 | 103.51 | 13,388 | 111.10 | 15,666 | 120.51 |
| .975 | .950 | 26 | 22.3 | 9,323 | 89.64 | 10,472 | 93.92 | 11,790 | 97.84 | 13,298 | 102.29 |
| .974 | .949 | 26 | 21.9 | 9,830 | 94.52 | 11,280 | 101.17 | 12,978 | 107.70 | 15,024 | 115.57 |
| .821 | .674 | 13 | 5.2 | 9,482 | 91.17 | 10,802 | 96.88 | 12,361 | 102.58 | 14,255 | 109.65 |
| .830 | .689 | 13 | 5.4 | 9,288 | 89.31 | 10,412 | 93.38 | 11,701 | 97.10 | 13,173 | 101.33 |
| .821 | .675 | 13 | 5.2 | 9,448 | 90.85 | 10,703 | 95.99 | 12,164 | 100.95 | 13,893 | 106.87 |
| .788 | .621 | 13 | 4.6 | 8,953 | 86.09 | 10,012 | 89.79 | 11,267 | 93.50 | 12,752 | 98.09 |
| .795 | .632 | 13 | 4.7 | 8,858 | 85.17 | 9,800 | 87.89 | 10,892 | 90.39 | 12,119 | 93.22 |
| .792 | .627 | 13 | 4.7 | 8,906 | 85.67 | 9,899 | 88.78 | 11,053 | 91.73 | 12,376 | 95.20 |
| .963 | .928 | 35 | 21.2 | 9,774 | 93.98 | 11,334 | 101.65 | 13,172 | 109.31 | 15,378 | 118.29 |
| .969 | .938 | 35 | 23.1 | 9,128 | 87.77 | 10,252 | 91.95 | 11,539 | 95.76 | 12,978 | 99.83 |
| .956 | .915 | 35 | 19.3 | 9,632 | 92.62 | 11,073 | 99.31 | 12,719 | 105.55 | 14,690 | 113.00 |
| .828 | .686 | 13 | 5.3 | 9,418 | 90.56 | 10,788 | 96.75 | 12,405 | 102.95 | 14,326 | 110.20 |
| .829 | .687 | 13 | 5.3 | 9,192 | 88.38 | 10,342 | 92.75 | 11,656 | 96.73 | 13,127 | 100.98 |
| .822 | .675 | 13 | 5.2 | 9,336 | 89.77 | 10,619 | 95.24 | 12,110 | 100.50 | 13,845 | 106.50 |
| .833 | .693 | 14 | 5.6 | 9,299 | 89.41 | 10,620 | 95.25 | 12,183 | 101.10 | 14,032 | 107.94 |
| .834 | .696 | 14 | 5.7 | 9,108 | 87.58 | 10,230 | 91.75 | 11,513 | 95.54 | 12,948 | 99.60 |
| .828 | .686 | 14 | 5.5 | 9,232 | 88.77 | 10,471 | 93.91 | 11,913 | 98.86 | 13,576 | 104.43 |
| .812 | .659 | 15 | 5.4 | 9,122 | 87.71 | 10,362 | 92.93 | 11,826 | 98.14 | 13,553 | 104.25 |
| .819 | .671 | 15 | 5.5 | 8,988 | 86.42 | 10,060 | 90.22 | 11,288 | 93.68 | 12,659 | 97.38 |
| .813 | .661 | 15 | 5.4 | 9,083 | 87.34 | 10,249 | 91.92 | 11,609 | 96.34 | 13,163 | 101.25 |
| .791 | .626 | 12 | 4.5 | 9,070 | 87.21 | 10,242 | 91.86 | 11,631 | 96.52 | 13,256 | 101.97 |
| .784 | .615 | 12 | 4.4 | 8,902 | 85.60 | 9,910 | 88.88 | 11,069 | 91.86 | 12,357 | 95.05 |
| .785 | .616 | 12 | 4.4 | 8,959 | 86.14 | 10,029 | 89.95 | 11,272 | 93.54 | 12,680 | 97.54 |
| .806 | .650 | 13 | 4.9 | 9,027 | 86.80 | 10,182 | 91.32 | 11,548 | 95.83 | 13,146 | 101.12 |
| .801 | .641 | 13 | 4.8 | 8,885 | 85.43 | 9,884 | 88.65 | 11,035 | 91.58 | 12,312 | 94.71 |
| .801 | .641 | 13 | 4.8 | 8,938 | 85.94 | 9,997 | 89.66 | 11,228 | 93.18 | 12,623 | 97.10 |
| .785 | .616 | 14 | 4.7 | 8,891 | 85.49 | 9,977 | 89.48 | 11,263 | 93.47 | 12,760 | 98.15 |
| .786 | .618 | 14 | 4.8 | 8,788 | 84.50 | 9,746 | 87.41 | 10,852 | 90.06 | 12,076 | 92.89 |
| .787 | .619 | 14 | 4.8 | 8,834 | 84.94 | 9,840 | 88.25 | 11,012 | 91.39 | 12,329 | 94.84 |

TABLE 1.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| 1949–61 | | | | | | |
| $Y = a + b X$ | 48.8991 | .0107 | -- | 1.8708 | .0032 | -- |
| $Y = a + b \log X$ [7] | −134.2166 | 61.7983 | -- | 1.9072 | 19.4399 | -- |
| $\log Y = a + b \log X$ [7] | .7009 | .3468 | -- | .0107 | .1089 | -- |
| 1949–62 | | | | | | |
| $Y = a + b X$ | 49.2455 | .0106 | -- | 1.7920 | .0028 | -- |
| $Y = a + b \log X$ [7] | −134.5184 | 61.8869 | -- | 1.8260 | 17.1362 | -- |
| $\log Y = a + b \log X$ [7] | .6996 | .3472 | -- | .0102 | .0960 | -- |
| 1949–63 | | | | | | |
| $Y = a + b X$ | 52.8081 | .0092 | -- | 1.7975 | .0025 | -- |
| $Y = a + b \log X$ [7] | −111.9161 | 55.2605 | -- | 1.8098 | 15.2487 | -- |
| $\log Y = a + b \log X$ [7] | .8248 | .3105 | -- | .0101 | .0854 | -- |
| Newsprint consumption per household as a function of average disposable personal income per household | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b X$ | 83.6525 | 0.0291 | -- | 11.1986 | 0.0021 | -- |
| $Y = a + b \log X$ [7] | −1070.4444 | 351.9787 | -- | 10.5501 | 24.5936 | -- |
| $\log Y = a + b \log X$ [7] | −.0825 | .6605 | -- | .0206 | .0479 | -- |
| 1947–61 | | | | | | |
| $Y = a + b X$ | 143.5507 | .0195 | -- | 7.6680 | .0049 | -- |
| $Y = a + b \log X$ [7] | −801.0376 | 281.0913 | -- | 7.6563 | 70.7971 | -- |
| $\log Y = a + b \log X$ [7] | .6636 | .4639 | -- | .0129 | .1195 | -- |
| Newsprint consumption as a function of population | | | | | | |
| 1920–62 [6] | | | | | | |
| $Y = a + b X$ | −5119.8884 | 68.8671 | -- | 333.7920 | 2.2879 | -- |
| $Y = a + b \log X$ [7] | −44043.0670 | 22694.4010 | -- | 343.7794 | 777.4351 | -- |
| $\log Y = a + b \log X$ [7] | −1.0487 | 2.1839 | -- | .0428 | .0967 | -- |
| 1948–62 | | | | | | |
| $Y = a + b X$ | −2448.7550 | 53.3206 | -- | 161.8510 | 3.3707 | -- |
| $Y = a + b \log X$ [7] | −38855.7150 | 20396.6990 | -- | 158.6693 | 1262.7661 | -- |
| $\log Y = a + b \log X$ [7] | .7085 | 1.3950 | -- | .0114 | .0907 | -- |
| Newsprint consumption as a function of gross national product | | | | | | |
| 1920–62 [6] | | | | | | |
| $Y = a + b X$ | 949.2199 | 12.3243 | -- | 237.6041 | .2887 | -- |
| $Y = a + b \log X$ [7] | −15491.8370 | 8286.5087 | -- | 249.6643 | 204.1828 | -- |
| $\log Y = a + b \log X$ [7] | 1.6830 | .8039 | -- | .0294 | .0240 | -- |
| 1948–62 | | | | | | |
| $Y = a + b X$ | 1706.5412 | 10.6471 | -- | 154.8255 | .6424 | -- |
| $Y = a + b \log X$ [7] | −21157.1170 | 10439.3810 | -- | 177.4182 | 727.2239 | -- |
| $\log Y = a + b \log X$ [7] | 1.9083 | .7180 | -- | .0115 | .0473 | -- |

See footnotes at end of table.

*for use in projecting demand for newsprint*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .706 | .499 | 11 | 3.3 | 8,881 | 85.39 | 9,938 | 89.13 | 11,192 | 92.88 | 12,644 | 97.26 |
| .692 | .479 | 11 | 3.2 | 8,746 | 84.10 | 9,669 | 86.72 | 10,738 | 89.11 | 11,916 | 91.66 |
| .693 | .480 | 11 | 3.2 | 8,773 | 84.36 | 9,729 | 87.26 | 10,845 | 90.00 | 12,091 | 93.01 |
| .734 | .538 | 12 | 3.7 | 8,881 | 85.39 | 9,935 | 89.10 | 11,184 | 92.81 | 12,631 | 97.16 |
| .722 | .521 | 12 | 3.6 | 8,747 | 84.11 | 9,672 | 86.74 | 10,740 | 89.13 | 11,920 | 91.69 |
| .722 | .521 | 12 | 3.6 | 8,774 | 84.37 | 9,732 | 87.28 | 10,846 | 90.01 | 12,097 | 93.05 |
| .714 | .509 | 13 | 3.7 | 8,755 | 84.18 | 9,745 | 87.40 | 10,920 | 90.62 | 12,271 | 94.39 |
| .709 | .503 | 13 | 3.6 | 8,664 | 83.31 | 9,550 | 85.65 | 10,579 | 87.79 | 11,709 | 90.07 |
| .710 | .504 | 13 | 3.6 | 8,684 | 83.50 | 9,598 | 86.08 | 10,663 | 88.49 | 11,848 | 91.14 |
| 0.934 | 0.873 | 26 | 13.4 | 9,889 | [9] 316.45 | 11,368 | [9] 336.82 | 13,127 | [9] 357.19 | 15,239 | [9] 383.38 |
| .942 | .887 | 26 | 14.3 | 9,480 | [9] 303.36 | 10,671 | [9] 316.18 | 12,054 | [9] 328.01 | 13,594 | [9] 341.99 |
| .938 | .880 | 26 | 13.8 | 9,781 | [9] 313.00 | 11,164 | [9] 330.80 | 12,796 | [9] 348.20 | 14,700 | [9] 369.80 |
| .739 | .547 | 13 | 4.0 | 9,361 | [9] 299.55 | 10,570 | [9] 313.20 | 12,012 | [9] 326.85 | 13,690 | [9] 344.40 |
| .740 | .548 | 13 | 4.0 | 9,253 | [9] 296.09 | 10,339 | [9] 306.33 | 11,605 | [9] 315.77 | 12,996 | [9] 326.94 |
| .733 | .537 | 13 | 3.9 | 9,312 | [9] 298.00 | 10,456 | [9] 309.80 | 11,802 | [9] 321.15 | 13,320 | [9] 335.10 |
| .981 | .962 | 36 | 30.1 | 9,204 | 88.50 | 10,237 | 91.81 | 11,477 | 95.24 | 12,786 | 98.35 |
| .980 | .960 | 36 | 29.2 | 8,564 | 82.35 | 9,250 | 82.96 | 10,015 | 83.11 | 10,763 | 82.79 |
| .967 | .936 | 36 | 22.6 | 10,320 | 99.23 | 12,020 | 107.80 | 14,240 | 118.17 | 16,800 | 129.23 |
| .975 | .951 | 13 | 15.8 | 8,642 | 83.10 | 9,442 | 84.68 | 10,402 | 86.32 | 11,415 | 87.81 |
| .976 | .952 | 13 | 16.2 | 8,425 | 81.01 | 9,042 | 81.09 | 9,730 | 80.75 | 10,402 | 80.02 |
| .974 | .948 | 13 | 15.4 | 8,754 | 84.17 | 9,648 | 86.53 | 10,750 | 89.21 | 11,950 | 91.92 |
| .991 | .981 | 36 | 42.7 | 9,699 | 93.26 | 11,302 | 101.36 | 13,150 | 109.13 | 15,430 | 118.69 |
| .990 | .979 | 36 | 40.6 | 8,135 | 78.22 | 8,740 | 78.39 | 9,332 | 77.44 | 9,948 | 76.52 |
| .985 | .970 | 36 | 33.5 | 9,443 | 90.80 | 10,810 | 96.95 | 12,340 | 102.41 | 14,160 | 108.92 |
| .977 | .955 | 13 | 16.6 | 9,266 | 89.10 | 10,650 | 95.52 | 12,247 | 101.63 | 14,217 | 109.36 |
| .970 | .941 | 13 | 14.4 | 8,608 | 82.77 | 9,371 | 84.04 | 10,116 | 83.95 | 10,892 | 83.78 |
| .973 | .947 | 13 | 15.2 | 9,026 | 86.79 | 10,180 | 91.30 | 11,460 | 95.10 | 12,960 | 99.69 |

TABLE 1.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| Newsprint consumption as a function of disposable personal income | | | | | | |
| 1929–62 [6] | | | | | | |
| $Y = a + b\,X$ | 873.2805 | 18.0775 | -- | 203.1235 | .4415 | -- |
| $Y = a + b \log X$ [7] | −16179.1320 | 9108.3492 | -- | 229.9488 | 252.3864 | -- |
| $\log Y = a + b \log X$ [7] | 1.7597 | .8241 | -- | .0184 | .0202 | -- |
| 1948–62 | | | | | | |
| $Y = a + b\,X$ | 1894.7019 | 14.8756 | -- | 137.9818 | .7961 | -- |
| $Y = a + b \log X$ [7] | −19085.8330 | 10291.2620 | -- | 137.0369 | 546.8198 | -- |
| $\log Y = a + b \log X$ [7] | 2.0582 | .7048 | -- | .0097 | .0386 | -- |
| Newsprint consumption as a function of households | | | | | | |
| 1920–62 [6] | | | | | | |
| $Y = a + b\,X$ | −2020.5424 | 175.1408 | -- | 310.3417 | 5.3977 | -- |
| $Y = a + b \log X$ [7] | −19019.4790 | 15100.3710 | -- | 374.2908 | 565.6923 | -- |
| $\log Y = a + b \log X$ [7] | 1.3398 | 1.4661 | -- | .0310 | .0604 | -- |
| 1947–62 | | | | | | |
| $Y = a + b\,X$ | −1897.5100 | 173.4198 | -- | 154.5899 | 8.7148 | -- |
| $Y = a + b \log X$ [7] | −24882.9840 | 18643.0660 | -- | 146.7147 | 887.5798 | -- |
| $\log Y = a + b \log X$ [7] | 1.5762 | 1.3270 | -- | .0114 | .0688 | -- |
| Newsprint consumption as a function of population and per capita gross national product | | | | | | |
| 1920–61 [6] | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −3373.3533 | 37.4356 | 1.3409 | 212.5440 | 4.6603 | 0.1836 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −42133.2300 | 5987.5533 | 2271.6862 | 220.9658 | 584.1799 | 314.1799 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −2.0707 | 1.1626 | 0.6215 | .0673 | .1780 | .0956 |
| 1947–61 | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −3646.4256 | 41.9881 | 1.1584 | 204.9243 | 10.6069 | .6595 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −50267.9840 | 7741.0743 | 2170.5323 | 187.5490 | 1608.2999 | 1526.8931 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −1.0625 | 1.1063 | .5289 | .0352 | .3017 | .2864 |
| Newsprint consumption as a function of population and per capita disposable personal income | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −3433.2578 | 32.4817 | 2.4232 | 205.5310 | 6.5607 | .3728 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −46085.9230 | 6710.6977 | 2421.2574 | 214.1188 | 844.6716 | 455.5019 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −1.6165 | .7799 | .8510 | .0451 | .1780 | .0960 |
| 1947–61 | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −3275.1434 | 5.5415 | 4.8004 | 186.0414 | 21.6744 | 1.9121 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −56664.1090 | 3657.4652 | 5911.5449 | 183.4985 | 3852.8690 | 3633.7885 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −2.1704 | .3299 | 1.2315 | .0356 | .7474 | .7049 |

See footnotes at end of table.

*for use in projecting demand for newsprint*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .992 | .985 | 27 | 40.9 | 9,912 | 95.31 | 11,539 | 103.49 | 13,347 | 110.76 | 15,697 | 120.75 |
| .990 | .980 | 27 | 36.1 | 8,404 | 80.81 | 9,059 | 81.25 | 9,678 | 80.32 | 10,361 | 79.70 |
| .992 | .985 | 27 | 40.8 | 9,636 | 92.65 | 11,050 | 99.10 | 12,570 | 104.32 | 14,490 | 111.46 |
| .982 | .964 | 13 | 18.7 | 9,333 | 89.74 | 10,671 | 95.70 | 12,159 | 100.90 | 14,093 | 108.41 |
| .982 | .965 | 13 | 18.8 | 8,690 | 83.56 | 9,457 | 84.82 | 10,130 | 84.07 | 10,901 | 83.85 |
| .981 | .963 | 13 | 18.3 | 9,129 | 87.78 | 10,260 | 92.02 | 11,460 | 95.10 | 12,940 | 99.54 |
| .983 | .967 | 36 | 32.4 | 8,926 | 85.83 | 9,801 | 87.90 | 10,852 | 90.06 | 11,903 | 91.56 |
| .976 | .952 | 36 | 26.7 | 8,099 | 77.88 | 8,604 | 77.17 | 9,162 | 76.03 | 9,676 | 74.43 |
| .971 | .942 | 36 | 24.3 | 9,391 | 90.30 | 10,510 | 94.26 | 11,910 | 98.84 | 13,363 | 102.79 |
| .983 | .966 | 14 | 19.9 | 8,941 | 85.97 | 9,808 | 87.96 | 10,849 | 90.03 | 11,889 | 91.45 |
| .985 | .969 | 14 | 21.0 | 8,598 | 82.67 | 9,221 | 82.70 | 9,910 | 82.24 | 10,546 | 81.12 |
| .982 | .964 | 14 | 19.3 | 9,106 | 87.56 | 10,090 | 90.49 | 11,290 | 93.69 | 12,530 | 96.38 |
| 0.992 | 0.984 | 34 | 54.9 | 8,986 | 86.40 | 10,017 | 89.84 | 11,160 | 92.61 | 12,421 | 95.55 |
| .991 | .983 | 34 | 53.8 | 8,305 | 79.86 | 8,943 | 80.21 | 9,610 | 79.75 | 10,281 | 79.08 |
| .985 | .969 | 34 | 43.5 | 9,801 | 94.24 | 11,291 | 101.26 | 13,062 | 108.40 | 15,135 | 116.42 |
| .970 | .941 | 12 | 3.3 | 9,037 | 86.89 | 10,073 | 90.34 | 11,234 | 93.23 | 12,506 | 96.20 |
| .975 | .950 | 12 | 2.2 | 8,706 | 83.71 | 9,458 | 84.83 | 10,252 | 85.08 | 11,045 | 84.96 |
| .968 | .937 | 12 | 3.7 | 9,365 | 90.05 | 10,661 | 95.61 | 12,166 | 100.96 | 13,914 | 107.03 |
| .992 | .984 | 25 | 25.5 | 9,139 | 87.88 | 10,183 | 91.33 | 11,325 | 93.98 | 12,633 | 97.18 |
| .991 | .982 | 25 | 29.4 | 8,578 | 82.48 | 9,267 | 83.11 | 9,991 | 82.91 | 10,730 | 82.54 |
| .991 | .982 | 25 | 20.0 | 9,602 | 92.33 | 10,960 | 98.30 | 12,504 | 103.77 | 14,384 | 110.65 |
| .975 | .951 | 12 | 0.1 | 9,398 | 90.37 | 10,586 | 94.94 | 11,790 | 97.84 | 13,263 | 102.02 |
| .976 | .952 | 12 | 1.0 | 8,869 | 85.28 | 9,664 | 86.67 | 10,444 | 86.67 | 11,283 | 86.79 |
| .967 | .935 | 12 | .2 | 9,657 | 92.86 | 11,060 | 99.19 | 12,581 | 104.41 | 14,503 | 111.56 |

TABLE 1.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| Newsprint consumption as a function of households and average disposable personal income per household | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b X + b_1 X_1$ | −3029.2287 | 114.5728 | .6224 | 206.5561 | 15.0892 | .1241 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −37653.0890 | 4908.6975 | 2862.7802 | 254.9103 | 648.5601 | 700.1771 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −2.0983 | .7633 | .9032 | .0497 | .1220 | .1317 |
| 1947–61 | | | | | | |
| $Y = a + b X + b_1 X_1$ | −2164.3918 | 173.7387 | .0418 | 171.8100 | 36.2149 | .3747 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −32390.6360 | 7317.5837 | 1201.6698 | 176.2735 | 1514.9649 | 2107.9053 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | 4.1665 | 1.4206 | −.1023 | .0308 | .2649 | .3685 |

[1] A measure of the closeness with which values of a dependent variable can be estimated from the values of an independent variable.
[2] A measure of the closeness with which the true values of the regression coefficients can be estimated from the values in the sample.
[3] A measure of the degree of relationship between the dependent and independent variables.
[4] A measure of the percent of the variation in the values of the dependent variable that is associated with variation in values of the independent variable.
[5] A measure of the probability that the given values of $b$ might have been obtained by chance from a population in which the true regression coefficient is zero.
[6] Excepting the war years 1942–46.
[7] Expressed in common logarithms.
[8] Expressed in natural logarithms.
[9] Pounds per household.

TABLE 2.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| Per capita sanitary and tissue paper consumption as a function of per capita disposable personal income | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b X$ | −13.0941 | 0.0184 | -- | 1.2680 | 0.0007 | -- |
| $Y = a + b \log X$ [7] | −172.0096 | 58.9792 | -- | 1.7589 | 3.0373 | -- |
| $\log Y = a + b \log X$ [7] | −5.3083 | 2.0286 | -- | 0.0552 | .0954 | -- |
| 1947–61 | | | | | | |
| $Y = a + b X$ | −19.4328 | .0220 | -- | .6287 | .0012 | -- |
| $Y = a + b \log X$ [7] | −270.5254 | 89.3336 | -- | .6881 | 5.2077 | -- |
| $\log Y = a + b \log X$ [7] | −5.1497 | 1.9819 | -- | .0131 | .0994 | -- |
| 1947–62 | | | | | | |
| $Y = a + b X$ | −17.0220 | .0206 | -- | .6952 | .0011 | -- |
| $Y = a + b \log X$ [7] | −259.2038 | 85.8455 | -- | .6951 | 4.5904 | -- |
| $\log Y = a + b \log X$ [7] | −4.7653 | 1.8634 | -- | .0153 | .1009 | -- |
| 1947–63 | | | | | | |
| $Y = a + b X$ | 18.0804 | .0212 | -- | .7234 | .0011 | -- |
| $Y = a + b \log X$ [7] | −268.9397 | 88.8569 | -- | .7460 | 4.5887 | -- |
| $\log Y = a + b \log X$ [7] | −4.8665 | 1.8947 | -- | .0152 | .0933 | -- |

See footnotes at end of table.

*for use in projecting demand for newsprint*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .992 | .983 | 25 | 26.2 | 9,111 | 87.61 | 10,119 | 90.75 | 11,242 | 93.29 | 12,490 | 96.08 |
| .987 | .975 | 25 | 17.4 | 8,374 | 80.52 | 8,991 | 80.64 | 9,631 | 79.93 | 10,278 | 79.06 |
| .990 | .980 | 25 | 40.7 | 9,655 | 92.84 | 11,046 | 99.07 | 12,640 | 104.90 | 14,577 | 112.13 |
| .979 | .958 | 12 | .01 | 9,029 | 86.82 | 9,927 | 89.03 | 10,998 | 91.27 | 12,078 | 92.91 |
| .978 | .956 | 12 | .4 | 8,668 | 83.35 | 9,332 | 83.70 | 10,049 | 83.39 | 10,733 | 82.56 |
| .975 | .951 | 12 | .1 | 9,150 | 87.98 | 10,120 | 90.76 | 11,331 | 94.03 | 12,550 | 96.54 |

*for use in projecting demand for sanitary and tissue paper.*

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| 0.983 | 0.967 | 26 | 27.4 | 3,232 | 31.07 | 3,936 | 35.30 | 4,763 | 39.53 | 5,820 | 44.77 |
| .967 | .936 | 26 | 19.4 | 2,844 | 27.35 | 3,312 | 29.70 | 3,837 | 31.84 | 4,456 | 34.28 |
| .972 | .946 | 26 | 21.3 | 3,680 | 35.38 | 4,750 | 42.60 | 6,085 | 50.50 | 7,961 | 61.24 |
| .982 | .965 | 13 | 18.8 | 3,470 | 33.37 | 4,285 | 38.43 | 5,241 | 43.49 | 6,469 | 49.76 |
| .979 | .958 | 13 | 17.2 | 3,270 | 31.44 | 3,901 | 34.99 | 4,608 | 38.24 | 5,451 | 41.93 |
| .984 | .968 | 13 | 19.9 | 3,686 | 35.44 | 4,738 | 42.49 | 6,047 | 50.18 | 7,873 | 60.56 |
| .981 | .962 | 14 | 18.7 | 3,372 | 32.42 | 4,143 | 37.16 | 5,048 | 41.89 | 6,209 | 47.76 |
| .981 | .961 | 14 | 18.7 | 3,221 | 30.97 | 3,833 | 34.38 | 4,520 | 37.51 | 5,336 | 41.05 |
| .980 | .960 | 14 | 18.5 | 3,552 | 34.15 | 4,516 | 40.50 | 5,706 | 47.35 | 7,348 | 56.52 |
| .982 | .964 | 15 | 20.0 | 3,411 | 32.80 | 4,201 | 37.68 | 5,127 | 42.55 | 6,317 | 48.59 |
| .981 | .962 | 15 | 19.4 | 3,268 | 31.42 | 3,897 | 34.95 | 4,601 | 38.18 | 5,440 | 41.85 |
| .982 | .965 | 15 | 20.3 | 3,590 | 34.52 | 4,577 | 41.05 | 5,798 | 48.12 | 7,488 | 57.60 |

TABLE 2.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| 1948–61 | | | | | | |
| $Y = a + b X$ | −19.3921 | .0220 | -- | .6799 | .0014 | -- |
| $Y = a + b \log X$ [7] | −273.4707 | 90.2324 | -- | .7199 | 6.2216 | -- |
| $\log Y = a + b \log X$ [7] | −5.0881 | 1.9631 | -- | .0148 | .1280 | -- |
| 1948–62 | | | | | | |
| $Y = a + b X$ | −20.4249 | .0226 | -- | .6810 | .0013 | -- |
| $Y = a + b \log X$ [7] | −283.5035 | 93.3312 | -- | .7365 | 5.8539 | -- |
| $\log Y = a + b \log X$ [7] | −5.1882 | 1.9940 | -- | .0144 | .1148 | -- |
| 1948–63 | | | | | | |
| $Y = a + b X$ | −18.2788 | .0213 | -- | .7477 | .0012 | -- |
| $Y = a + b \log X$ [7] | −273.8778 | 90.3612 | -- | .7608 | 5.2167 | -- |
| $\log Y = a + b \log X$ [7] | −4.8375 | 1.8858 | -- | .0157 | .1076 | -- |
| 1949–61 | | | | | | |
| $Y = a + b X$ | −19.7297 | .0222 | -- | .7082 | .0017 | -- |
| $Y = a + b \log X$ [7] | −277.8647 | 91.5741 | -- | .7464 | 7.2596 | -- |
| $\log Y = a + b \log X$ [7] | −5.0916 | 1.9641 | -- | .0155 | .1504 | -- |
| 1949–62 | | | | | | |
| $Y = a + b X$ | −16.9988 | .0206 | -- | .7554 | .0015 | -- |
| $Y = a + b \log X$ [7] | −265.0448 | 87.6274 | -- | .7470 | 6.1247 | -- |
| $\log Y = a + b \log X$ [7] | −4.6663 | 1.8332 | -- | .0165 | .1351 | -- |
| 1949–63 | | | | | | |
| $Y = a + b X$ | −18.3426 | .0214 | -- | .7758 | .0014 | -- |
| $Y = a + b \log X$ [7] | −276.8788 | 91.2742 | -- | .7855 | 5.9392 | -- |
| $\log Y = a + b \log X$ [7] | −4.8036 | 1.8755 | -- | .0163 | .1229 | -- |
| Per capita sanitary and tissue paper consumption as a function of per capita gross national product | | | | | | |
| 1920–61 [6] | | | | | | |
| $Y = a + b X$ | −11.7070 | .0121 | -- | 1.7370 | .0005 | -- |
| $Y = a + b \log X$ [7] | −162.4008 | 53.2922 | -- | 2.2122 | 2.8288 | -- |
| $\log Y = a + b \log X$ [7] | −5.7311 | 2.0547 | -- | .0959 | .1226 | -- |
| 1947–61 | | | | | | |
| $Y = a + b X$ | −17.6247 | .0144 | -- | 1.3486 | .0018 | -- |
| $Y = a + b \log X$ [7] | −265.2034 | 83.5286 | -- | 1.3995 | 10.6698 | -- |
| $\log Y = a + b \log X$ [7] | −5.1006 | 1.8733 | -- | .0284 | .2162 | -- |
| Sanitary and tissue paper consumption per household as a function of average disposable personal income per household | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b X$ | −64.0004 | 0.213 | -- | 5.8398 | 0.0011 | -- |
| $Y = a + b \log X$ [7] | −885.1102 | 251.3026 | -- | 7.0495 | 16.4333 | -- |
| $\log Y = a + b \log X$ [7] | −6.9986 | 2.3256 | -- | .0658 | .1534 | -- |
| 1947–61 | | | | | | |
| $Y = a + b X$ | −83.1309 | .0245 | -- | 2.0389 | .0013 | -- |
| $Y = a + b \log X$ [7] | −1264.3234 | 351.6100 | -- | 2.1010 | 19.4274 | -- |
| $\log Y = a + b \log X$ [7] | −6.5034 | 2.1987 | -- | .0134 | .1242 | -- |

See footnotes at end of table.

*for use in projecting demand for sanitary and tissue paper*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .976 | .952 | 12 | 15.4 | 3,475 | 33.41 | 4,289 | 38.47 | 5,245 | 43.53 | 6,474 | 49.80 |
| .973 | .946 | 12 | 14.5 | 3,279 | 31.53 | 3,916 | 35.12 | 4,628 | 38.41 | 5,477 | 42.13 |
| .975 | .951 | 12 | 15.3 | 3,670 | 35.29 | 4,709 | 42.23 | 6,000 | 49.79 | 7,799 | 59.99 |
| .979 | .958 | 13 | 17.3 | 3,517 | 33.82 | 4,350 | 39.01 | 5,327 | 44.21 | 6,584 | 50.65 |
| .975 | .951 | 13 | 15.9 | 3,326 | 31.98 | 3,979 | 35.69 | 4,709 | 39.08 | 5,581 | 42.93 |
| .979 | .959 | 13 | 17.4 | 3,707 | 35.64 | 4,770 | 42.78 | 6,092 | 50.56 | 7,944 | 61.11 |
| .978 | .957 | 14 | 17.6 | 3,415 | 32.84 | 4,208 | 37.74 | 5,138 | 42.64 | 6,332 | 48.71 |
| .977 | .955 | 14 | 17.3 | 3,282 | 31.56 | 3,919 | 35.15 | 4,632 | 38.44 | 5,482 | 42.17 |
| .978 | .956 | 14 | 17.5 | 3,477 | 33.43 | 4,563 | 40.92 | 5,774 | 47.92 | 7,452 | 57.32 |
| .970 | .942 | 11 | 13.3 | 3,489 | 33.55 | 4,311 | 38.66 | 5,273 | 43.76 | 6,512 | 50.09 |
| .967 | .935 | 11 | 12.6 | 3,295 | 31.68 | 3,938 | 35.32 | 4,657 | 38.65 | 5,516 | 42.43 |
| .969 | .939 | 11 | 13.1 | 3,669 | 35.28 | 4,708 | 42.22 | 6,000 | 49.79 | 7,799 | 59.99 |
| .971 | .943 | 12 | 14.1 | 3,374 | 32.44 | 4,146 | 37.18 | 5,051 | 41.92 | 6,213 | 47.79 |
| .972 | .945 | 12 | 14.3 | 3,240 | 31.15 | 3,862 | 34.64 | 4,559 | 37.83 | 5,387 | 41.44 |
| .969 | .939 | 12 | 13.6 | 3,527 | 33.91 | 4,471 | 40.10 | 5,635 | 46.76 | 7,234 | 55.65 |
| .974 | .949 | 13 | 15.6 | 3,434 | 33.02 | 4,230 | 37.94 | 5,165 | 42.86 | 6,365 | 48.96 |
| .974 | .948 | 13 | 15.4 | 3,292 | 31.65 | 3,934 | 35.28 | 4,651 | 38.60 | 5,507 | 42.36 |
| .973 | .947 | 13 | 15.3 | 3,573 | 34.36 | 4,548 | 40.79 | 5,751 | 47.73 | 7,415 | 57.04 |
| .972 | .945 | 35 | 24.4 | 3,073 | 29.55 | 3,768 | 33.79 | 4,581 | 38.02 | 5,587 | 42.98 |
| .954 | .910 | 35 | 18.8 | 2,690 | 25.87 | 3,136 | 28.13 | 3,638 | 30.19 | 4,211 | 32.39 |
| .943 | .889 | 35 | 16.8 | 3,505 | 33.70 | 4,593 | 41.19 | 5,961 | 49.47 | 7,817 | 60.13 |
| .915 | .838 | 13 | 8.2 | 3,274 | 31.48 | 4,183 | 36.52 | 5,008 | 41.56 | 6,170 | 47.46 |
| .908 | .825 | 13 | 7.8 | 3,108 | 29.88 | 3,727 | 33.43 | 4,418 | 36.66 | 5,214 | 40.11 |
| .923 | .853 | 13 | 8.7 | 3,423 | 32.91 | 4,406 | 39.52 | 5,626 | 46.69 | 7,254 | 55.80 |
| 0.965 | 0.931 | 26 | 18.8 | 3,325 | [9] 106.40 | 4,094 | [9] 121.31 | 5,006 | [9] 136.22 | 6,177 | [9] 155.39 |
| .949 | .900 | 26 | 15.3 | 2,992 | [9] 95.75 | 3,540 | [9] 104.90 | 4,166 | [9] 113.35 | 4,902 | [9] 123.33 |
| .948 | .898 | 26 | 15.2 | 3,743 | [9] 119.77 | 4,913 | [9] 145.56 | 6,406 | [9] 174.30 | 8,572 | [9] 215.65 |
| .982 | .964 | 13 | 18.7 | 3,527 | [9] 112.87 | 4,388 | [9] 130.02 | 5,408 | [9] 147.17 | 6,726 | [9] 169.22 |
| .981 | .962 | 13 | 18.1 | 3,376 | [9] 108.04 | 4,079 | [9] 120.85 | 4,876 | [9] 132.67 | 5,829 | [9] 146.63 |
| .980 | .960 | 13 | 17.7 | 3,742 | [9] 119.75 | 4,860 | [9] 144.00 | 6,274 | [9] 170.73 | 8,298 | [9] 208.75 |

TABLE 2.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| Sanitary and tissue paper consumption as a function of population | | | | | | |
| 1920–62 [6] | | | | | | |
| $Y = a + b X$ | −3191.1555 | 29.5760 | -- | 95.8227 | .6565 | -- |
| $Y = a + b \log X$ [7] | −19756.3830 | 9675.1749 | -- | 131.9457 | 298.1136 | -- |
| $\log Y = a + b \log X$ [7] | −7.5751 | 4.8673 | -- | .0642 | .1452 | -- |
| 1947–62 | | | | | | |
| $Y = a + b X$ | −3384.0861 | 30.8309 | -- | 54.0338 | 1.0271 | -- |
| $Y = a + b \log X$ [7] | −24122.0000 | 11653.3610 | -- | 61.8572 | 445.5002 | -- |
| $\log Y = a + b \log X$ [7] | −3.5242 | 3.0425 | -- | .0147 | .1058 | -- |
| Sanitary and tissue paper consumption as a function of gross national product | | | | | | |
| 1920–62 [6] | | | | | | |
| $Y = a + b X$ | −571.0458 | 5.2400 | -- | 96.3065 | .1169 | -- |
| $Y = a + b \log X$ [7] | −7380.2697 | 3446.5653 | -- | 174.2856 | 142.0936 | -- |
| $\log Y = a + b \log X$ [7] | −1.3677 | 1.7416 | -- | .0793 | .0646 | -- |
| 1947–62 | | | | | | |
| $Y = a + b X$ | −912.4462 | 6.0036 | -- | 88.8620 | .3334 | -- |
| $Y = a + b \log X$ [7] | −13463.7590 | 5758.3914 | -- | 111.7207 | 407.1283 | -- |
| $\log Y = a + b \log X$ [7] | −0.7907 | 1.5221 | -- | .0224 | .0816 | -- |
| Sanitary and tissue paper consumption as a function of disposable personal income | | | | | | |
| 1929–62 [6] | | | | | | |
| $Y = a + b X$ | −654.2692 | 7.8942 | -- | 69.6435 | .1514 | -- |
| $Y = a + b \log X$ [7] | −7961.7821 | 3915.8414 | -- | 147.7416 | 162.1205 | -- |
| $\log Y = a + b \log X$ [7] | −.9715 | 1.6946 | -- | .0477 | .0523 | -- |
| 1947–62 | | | | | | |
| $Y = a + b X$ | −856.7323 | 8.5500 | -- | 46.3605 | .2439 | -- |
| $Y = a + b \log X$ [7] | −12548.9750 | 5768.5048 | -- | 67.0487 | 239.4633 | -- |
| $\log Y = a + b \log X$ [7] | −.5198 | 1.5130 | -- | .0120 | .0429 | -- |
| Sanitary and tissue paper consumption as a function of households | | | | | | |
| 1920–62 [6] | | | | | | |
| $Y = a + b X$ | −1850.2009 | 74.9955 | -- | 101.6740 | 1.7684 | -- |
| $Y = a + b \log X$ [7] | −9051.9730 | 6416.4686 | -- | 161.6311 | 244.2847 | -- |
| $\log Y = a + b \log X$ [7] | −2.2864 | 3.2898 | -- | .0378 | .0571 | -- |
| 1947–62 | | | | | | |
| $Y = a + b X$ | −2585.9103 | 90.5819 | -- | 80.1006 | 4.5156 | -- |
| $Y = a + b \log X$ [7] | −14436.1520 | 9644.7212 | -- | 96.3796 | 583.0680 | -- |
| $\log Y = a + b \log X$ [7] | −1.0347 | 2.5416 | -- | .0189 | .1141 | -- |
| Sanitary and tissue paper consumption as a function of population and per capita gross national product | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b X + b_1 X_1$ | −2763.7827 | 22.3814 | 0.2912 | 80.0449 | 1.7551 | 0.0691 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −19035.0340 | 3305.9787 | 488.5160 | 119.1020 | 315.1967 | 169.3450 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −17.2410 | 3.8602 | .6316 | .1308 | .3461 | .1859 |

See footnotes at end of table.

*for use in projecting demand for sanitary and tissue paper*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .991 | .982 | 36 | 45.0 | 2,961 | 28.47 | 3,404 | 30.53 | 3,937 | 32.67 | 4,499 | 34.61 |
| .983 | .967 | 36 | 32.5 | 2,671 | 25.68 | 2,964 | 26.58 | 3.290 | 27.30 | 3,609 | 27.76 |
| .984 | .969 | 36 | 33.5 | 5,100 | 49.04 | 7,158 | 64.20 | 10,445 | 86.68 | 15,110 | 116.23 |
| .992 | .985 | 14 | 30.0 | 3,029 | 29.12 | 3,491 | 31.31 | 4,046 | 33.58 | 4,632 | 35.63 |
| .990 | .980 | 14 | 26.2 | 2,891 | 27.80 | 3,244 | 29.09 | 3,637 | 30.18 | 4,021 | 30.93 |
| .992 | .983 | 14 | 28.8 | 3,377 | 32.47 | 4,174 | 37.43 | 5,286 | 43.87 | 6,658 | 51.22 |
| .991 | .982 | 36 | 44.8 | 3,149 | 30.28 | 3,831 | 34.36 | 4,617 | 38.32 | 5,586 | 42.97 |
| .971 | .942 | 36 | 24.3 | 2,447 | 23.53 | 2,698 | 24.20 | 2,944 | 24.43 | 3,201 | 24.62 |
| .976 | .953 | 36 | 26.9 | 3,964 | 38.12 | 5,312 | 47.64 | 7,072 | 58.69 | 9,531 | 73.32 |
| .979 | .959 | 14 | 18.0 | 3,350 | 32.21 | 4,131 | 37.05 | 5,031 | 41.75 | 6,142 | 47.25 |
| .967 | .935 | 14 | 14.1 | 2,955 | 28.41 | 3,375 | 30.27 | 3,786 | 31.42 | 4,215 | 32.42 |
| .980 | .961 | 14 | 18.6 | 3,543 | 34.07 | 4,574 | 41.02 | 5,875 | 48.76 | 7,625 | 58.65 |
| .995 | .990 | 27 | 52.2 | 3,293 | 31.66 | 4,003 | 35.90 | 4,793 | 39.78 | 5,819 | 44.76 |
| .978 | .956 | 27 | 24.2 | 2,607 | 25.07 | 2,888 | 25.90 | 3,155 | 26.18 | 3,448 | 26.52 |
| .987 | .975 | 27 | 32.4 | 4,002 | 38.48 | 5,297 | 47.51 | 6,906 | 57.31 | 9,252 | 71.17 |
| .994 | .989 | 14 | 35.1 | 3,418 | 32.87 | 4,188 | 37.56 | 5,043 | 41.85 | 6,154 | 47.34 |
| .988 | .976 | 14 | 24.1 | 3,020 | 29.04 | 3,435 | 30.81 | 3,827 | 31.76 | 4,259 | 32.76 |
| .994 | .989 | 14 | 35.3 | 3,662 | 35.21 | 4,705 | 42.20 | 5,963 | 49.49 | 7,741 | 59.55 |
| .990 | .980 | 36 | 42.4 | 2,837 | 27.28 | 3,212 | 28.81 | 3,662 | 30.39 | 4,112 | 31.63 |
| .975 | .950 | 36 | 26.3 | 2,471 | 23.76 | 2,686 | 24.09 | 2,923 | 24.26 | 3,142 | 24.17 |
| .995 | .989 | 36 | 57.6 | 4,185 | 40.24 | 5,391 | 48.35 | 7,134 | 59.20 | 9,234 | 71.03 |
| .983 | .966 | 14 | 20.1 | 3,075 | 29.57 | 3,528 | 31.64 | 4,072 | 33.79 | 4,615 | 35.50 |
| .975 | .951 | 14 | 16.5 | 2,885 | 27.74 | 3,207 | 28.76 | 3,564 | 29.58 | 3,892 | 29.94 |
| .986 | .973 | 14 | 22.3 | 3,386 | 32.56 | 4,118 | 36.93 | 5,114 | 42.44 | 6,242 | 48.02 |
| 0.993 | 0.987 | 34 | 18.3 | 2,885 | 27.74 | 3,322 | 29.79 | 3,827 | 31.76 | 4,372 | 33.63 |
| .986 | .971 | 34 | 8.6 | 2,585 | 24.86 | 2,863 | 25.68 | 3,163 | 26.25 | 3,460 | 26.62 |
| .988 | .976 | 34 | 11.9 | 4,918 | 47.29 | 6,844 | 61.38 | 9,770 | 81.08 | 13,900 | 106.92 |

TABLE 2.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | |
|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | | $b$ | $b_1$ |
| 1947–61 | | | | | | |
| $Y = a + b\,X + b_1\,X_1$ | −3309.5983 | 31.0805 | −.0453 | 58.4301 | 3.0244 | .1880 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −22753.7390 | 5375.2863 | −378.3682 | 65.4012 | 560.8388 | 532.4510 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −9.0203 | 2.8308 | .2522 | .0378 | .3245 | .3081 |
| Sanitary and tissue paper consumption as a function of population and per capita disposable personal income | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b\,X + b_1\,X_1$ | −3142.5133 | 24.8848 | .4095 | 52.1237 | 1.6638 | .0946 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −21900.9480 | 4135.9461 | 333.5364 | 68.8507 | 271.6071 | 146.4682 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −14.6849 | 2.4190 | 1.3008 | .1105 | .4357 | .2350 |
| 1947–61 | | | | | | |
| $Y = a + b\,X + b_1\,X_1$ | −3301.2490 | 24.6411 | .5169 | 56.7429 | 6.6107 | .5832 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −24737.1340 | 4583.3159 | 406.3109 | 66.4998 | 1396.2796 | 1316.8848 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −11.1176 | 1.6990 | 1.3149 | .0338 | .7103 | .6699 |
| Sanitary and tissue paper consumptions as a function of households and average disposable personal income per household | | | | | | |
| 1929–61 [6] | | | | | | |
| $Y = a + b\,X + b_1\,X_1$ | −2166.1157 | 70.2653 | .0865 | 71.4678 | 5.2208 | .0429 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −12520.5740 | 2854.5552 | 368.1531 | 105.5958 | 268.6639 | 290.0461 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −8.6674 | 2.6474 | .6723 | .0861 | .2191 | .2366 |
| 1947–61 | | | | | | |
| $Y = a + b\,X + b_1\,X_1$ | −3467.3122 | 42.1778 | .5041 | 56.1641 | 11.8385 | .1225 |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −33694.2330 | 1840.3004 | 3236.0079 | 67.6888 | 581.7443 | 809.4325 |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −12.0370 | 1.4193 | 1.5984 | .0318 | .2732 | .3801 |

[1] A measure of the closeness with which values of a dependent variable can he estimated from the values of an independent variable.

[2] A measure of the closeness with which the true values of the regression coefficients can he estimated from the values in the sample.

[3] A measure of the degree of relationship hetween the dependent and independent variables.

[4] A measure of the percent of the variation in the values of the dependent variable that is associated with variation in values of the independent variable.

[5] A measure of the prohability that the given values of $b$ might have heen ohtained hy chance from a population in which the true regression coefficient is zero.

[6] Excepting the war years 1942–46.

[7] Expressed in common logarithms.

[8] Expressed in natural logarithms.

[9] Pounds per household.

*for use in projecting demand for sanitary and tissue paper*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .990 | .981 | 12 | 0.1 | 3,001 | 28.86 | 3,451 | 30.95 | 3,995 | 33.15 | 4,567 | 35.13 |
| .988 | .976 | 12 | .5 | 2,859 | 27.49 | 3,197 | 28.67 | 3,580 | 29.71 | 3,952 | 30.40 |
| .989 | .979 | 12 | .7 | 3,431 | 32.99 | 4,283 | 38.41 | 5,457 | 45.29 | 6,933 | 53.33 |
| .997 | .994 | 25 | 19.5 | 3,016 | 29.00 | 3,484 | 31.25 | 4,026 | 33.41 | 4,615 | 35.50 |
| .995 | .990 | 25 | 5.4 | 2,771 | 26.64 | 3,089 | 27.70 | 3,438 | 28.53 | 3,784 | 29.11 |
| .987 | .975 | 25 | 31.9 | 4,237 | 40.74 | 5,658 | 50.74 | 7,600 | 63.07 | 10,330 | 79.46 |
| .991 | .982 | 12 | .9 | 3,065 | 29.47 | 3,553 | 31.87 | 4,116 | 34.16 | 4,731 | 36.39 |
| .987 | .975 | 12 | .1 | 2,889 | 27.78 | 3,245 | 29.10 | 3,635 | 30.17 | 4,021 | 30.93 |
| .991 | .983 | 12 | 4.2 | 3,587 | 34.49 | 4,554 | 40.84 | 5,801 | 48.14 | 7,477 | 57.52 |
| .995 | .989 | 25 | 4.2 | 2,917 | 28.05 | 3,329 | 29.86 | 3,811 | 31.63 | 4,311 | 33.16 |
| .988 | .976 | 25 | 1.7 | 2,592 | 24.92 | 2,843 | 25.50 | 3,114 | 25.84 | 3,372 | 25.94 |
| .992 | .985 | 25 | 8.4 | 4,114 | 39.56 | 5,336 | 47.86 | 7,042 | 58.44 | 9,218 | 70.91 |
| .991 | .982 | 12 | 13.8 | 3,202 | 30.79 | 3,765 | 33.77 | 4,371 | 36.27 | 5,078 | 39.06 |
| .987 | .974 | 12 | 10.8 | 2,998 | 28.83 | 3,411 | 30.59 | 3,819 | 31.69 | 4,259 | 32.76 |
| .992 | .985 | 12 | 19.2 | 3,630 | 34.90 | 4,631 | 41.53 | 5,914 | 49.08 | 7,650 | 58.85 |

TABLE 3.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | | |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | $b^2$ | | $b$ | $b_1$ | $b^2$ |
| Per capita container board consumption as a function of per capita disposable personal income | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b\,X$ | −31.4270 | 0.0627 | -- | -- | 4.2963 | 0.0023 | -- | -- |
| $Y = a + b \log X$ [7] | −578.1981 | 202.5600 | -- | -- | 5.0833 | 8.7779 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.2714 | 1.5918 | -- | -- | .0427 | .0737 | -- | -- |
| 1947–61 | | | | | | | | |
| $Y = a + b\,X$ | −37.2382 | .0659 | -- | -- | 3.3629 | .0062 | -- | -- |
| $Y = a + b \log X$ [7] | −792.7026 | 268.6300 | -- | -- | 3.3661 | 25.4741 | -- | -- |
| $\log Y = a + b \log X$ [7] | −2.9121 | 1.4811 | -- | -- | .0193 | .1463 | -- | -- |
| 1947–62 | | | | | | | | |
| $Y = a + b\,X$ | −34.8748 | .0646 | -- | -- | 3.3105 | .0053 | -- | -- |
| $Y = a + b \log X$ [7] | −793.6421 | 268.9453 | -- | -- | 3.2993 | 21.7881 | -- | -- |
| $\log Y = a + b \log X$ [7] | −2.7924 | 1.4443 | -- | -- | .0191 | .1262 | -- | -- |
| 1947–63 | | | | | | | | |
| $Y = a + b\,X$ | −37.9992 | .0664 | -- | -- | 3.4110 | .0050 | -- | -- |
| $Y = a + b \log X$ [7] | −822.8730 | 277.9900 | -- | -- | 3.4397 | 21.1561 | -- | -- |
| $\log Y = a + b \log X$ [7] | −2.8798 | 1.4714 | -- | -- | .0191 | .1173 | -- | -- |
| 1948–61 | | | | | | | | |
| $Y = a + b\,X$ | −42.5035 | .0687 | -- | -- | 3.4430 | .0072 | -- | -- |
| $Y = a + b \log X$ [7] | −842.8797 | 283.9800 | -- | -- | 3.3680 | 29.1088 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.1738 | 1.5612 | -- | -- | .0196 | .1696 | -- | -- |
| 1948–62 | | | | | | | | |
| $Y = a + b\,X$ | −47.6886 | .0717 | -- | -- | 3.4461 | .0066 | -- | -- |
| $Y = a + b \log X$ [7] | −887.9660 | 297.9056 | -- | -- | 3.4300 | 27.2629 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.3142 | 1.6046 | -- | -- | .0192 | .1525 | -- | -- |
| 1948–63 | | | | | | | | |
| $Y = a + b\,X$ | −42.4254 | .0687 | -- | -- | 3.4135 | .0055 | -- | -- |
| $Y = a + b \log X$ [7] | −867.6493 | 291.6303 | -- | -- | 3.3512 | 22.9798 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.0830 | 1.5332 | -- | -- | .0190 | .1302 | -- | -- |
| 1949–61 | | | | | | | | |
| $Y = a + b\,X$ | −45.3355 | .0702 | -- | -- | 3.5701 | .0084 | -- | -- |
| $Y = a + b \log X$ [7] | −871.3102 | 292.6609 | -- | -- | 3.4685 | 33.7358 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.3207 | 1.6061 | -- | -- | .0203 | .1971 | -- | -- |
| 1949–62 | | | | | | | | |
| $Y = a + b\,X$ | −39.1603 | .0668 | -- | -- | 3.5000 | .0068 | -- | -- |
| $Y = a + b \log X$ [7] | −846.7843 | 285.1106 | -- | -- | 3.3468 | 27.4396 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.0361 | 1.5185 | -- | -- | .0200 | .1640 | -- | -- |
| 1949–63 | | | | | | | | |
| $Y = a + b\,X$ | −44.3020 | .0697 | -- | -- | 3.5225 | .0062 | -- | -- |
| $Y = a + b \log X$ [7] | −890.4892 | 298.5787 | -- | -- | 3.4247 | 25.8953 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.1715 | 1.5602 | -- | -- | .0196 | .1479 | -- | -- |

See footnotes at end of table.

*for use in projecting demand for container board.*

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| 0.983 | 0.967 | 26 | 27.5 | 12,381 | 119.05 | 14,882 | 133.47 | 17,822 | 147.90 | 21,549 | 165.76 |
| .977 | .954 | 26 | 23.1 | 11,076 | 106.50 | 12,772 | 114.55 | 14,691 | 121.92 | 16,936 | 130.28 |
| .973 | .947 | 26 | 21.6 | 13,374 | 128.60 | 16,587 | 148.76 | 20,485 | 170.00 | 25,708 | 197.75 |
| .946 | .896 | 13 | 10.6 | 12,576 | 120.92 | 15,173 | 136.08 | 18,224 | 151.24 | 22,103 | 170.02 |
| .946 | .895 | 13 | 10.5 | 11,993 | 115.32 | 14,049 | 126.00 | 16,361 | 135.78 | 19,092 | 146.86 |
| .942 | .888 | 13 | 10.1 | 12,922 | 124.25 | 15,866 | 142.30 | 19,413 | 161.10 | 24,109 | 185.45 |
| .957 | .915 | 14 | 12.3 | 12,498 | 120.17 | 15,055 | 135.02 | 18,061 | 149.88 | 21,878 | 168.29 |
| .957 | .916 | 14 | 12.3 | 12,007 | 115.45 | 14,065 | 126.14 | 16,380 | 135.93 | 19,114 | 147.03 |
| .951 | .903 | 14 | 11.4 | 12,782 | 122.90 | 15,643 | 140.30 | 19,079 | 158.33 | 23,612 | 181.63 |
| .960 | .921 | 15 | 13.3 | 12,621 | 121.36 | 15,234 | 136.63 | 18,304 | 151.90 | 22,208 | 170.83 |
| .959 | .920 | 15 | 13.1 | 12,146 | 116.79 | 14,254 | 127.84 | 16,624 | 137.96 | 19,426 | 149.43 |
| .955 | .913 | 15 | 12.5 | 12,906 | 124.10 | 15,833 | 142.00 | 19,361 | 160.67 | 24,018 | 184.75 |
| .940 | .883 | 12 | 9.5 | 12,728 | 122.38 | 15,407 | 138.18 | 18,555 | 153.98 | 22,563 | 173.56 |
| .942 | .888 | 12 | 9.8 | 12,171 | 117.03 | 14,308 | 128.32 | 16,709 | 138.66 | 19,548 | 150.37 |
| .936 | .876 | 12 | 9.2 | 13,193 | 126.86 | 16,320 | 146.37 | 20,103 | 166.83 | 25,155 | 193.50 |
| .949 | .901 | 13 | 10.9 | 12,937 | 124.39 | 15,708 | 140.88 | 18,963 | 157.37 | 23,115 | 177.81 |
| .950 | .902 | 13 | 10.9 | 12,378 | 119.02 | 14,591 | 130.86 | 17,076 | 141.71 | 20,019 | 153.99 |
| .946 | .895 | 13 | 10.5 | 13,388 | 128.73 | 16,625 | 149.10 | 20,557 | 170.60 | 25,825 | 198.65 |
| .958 | .917 | 14 | 12.4 | 12,735 | 122.45 | 15,416 | 138.26 | 18,564 | 154.06 | 22,573 | 173.64 |
| .959 | .920 | 14 | 12.7 | 12,284 | 118.12 | 14,463 | 129.71 | 16,910 | 140.33 | 19,807 | 152.36 |
| .953 | .908 | 14 | 11.8 | 13,078 | 125.75 | 16,134 | 144.70 | 19,828 | 164.55 | 24,747 | 190.36 |
| .865 | .930 | 11 | 8.4 | 12,807 | 123.14 | 15,531 | 139.29 | 18,731 | 155.44 | 22,807 | 175.44 |
| .934 | .872 | 11 | 8.7 | 12,267 | 117.95 | 14,448 | 129.58 | 16,898 | 140.23 | 19,800 | 152.31 |
| .926 | .858 | 11 | 8.1 | 13,345 | 128.32 | 16,572 | 148.63 | 20,493 | 170.07 | 25,747 | 198.05 |
| .944 | .891 | 12 | 9.9 | 12,601 | 121.16 | 15,222 | 136.52 | 18,303 | 151.89 | 22,221 | 170.93 |
| .949 | .900 | 12 | 10.4 | 12,163 | 116.95 | 14,303 | 128.28 | 16,709 | 138.66 | 19,555 | 150.42 |
| .937 | .877 | 12 | 9.3 | 12,993 | 124.93 | 16,011 | 143.60 | 19,654 | 163.10 | 24,486 | 188.35 |
| .952 | .906 | 13 | 11.2 | 12,790 | 122.98 | 15,500 | 139.01 | 18,682 | 155.04 | 22,737 | 174.90 |
| .954 | .911 | 13 | 11.5 | 12,352 | 118.77 | 14,566 | 130.64 | 17,052 | 141.51 | 19,998 | 153.83 |
| .946 | .895 | 13 | 10.6 | 13,163 | 126.57 | 16,279 | 146.00 | 20,051 | 166.40 | 25,090 | 193.00 |

TABLE 3.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | | |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | $b^2$ | | $b$ | $b_1$ | $b^2$ |
| Per capita container board consumption as a function of per capita gross national product | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b X$ | −19.7232 | .0387 | -- | -- | 4.5427 | .0015 | -- | -- |
| $Y = a + b \log X$ [7] | −508.5362 | 172.5366 | -- | -- | 5.6591 | 8.3711 | -- | -- |
| $\log Y = a + b \log X$ [7] | −2.7503 | 1.3635 | -- | -- | .0427 | .0632 | -- | -- |
| 1947–61 | | | | | | | | |
| $Y = a + b X$ | −38.9845 | .0460 | -- | -- | 3.6125 | .0047 | -- | -- |
| $Y = a + b \log X$ [7] | −830.3659 | 266.8927 | -- | -- | 3.7393 | 28.5081 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.1631 | 1.4843 | -- | -- | .0201 | .1533 | -- | -- |
| Container board consumption per household as a function of average disposable personal income per household | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b X$ | −156.4307 | 0.0700 | -- | -- | 19.5409 | 0.0038 | -- | -- |
| $Y = a + b \log X$ [7] | −2884.5198 | 833.8859 | -- | -- | 21.5084 | 50.1387 | -- | -- |
| $\log Y = a + b \log X$ [7] | −4.2870 | 1.7739 | -- | -- | .0500 | .1165 | -- | -- |
| 1947–61 | | | | | | | | |
| $Y = a + b X$ | −157.1388 | .0704 | -- | -- | 11.6188 | .0075 | -- | -- |
| $Y = a + b \log X$ [7] | −3566.0023 | 1014.1900 | -- | -- | 11.3811 | 105.2398 | -- | -- |
| $\log Y = a + b \log X$ [7] | −3.5863 | 1.5903 | -- | -- | .0193 | .1780 | -- | -- |
| Container board consumption as a function of population | | | | | | | | |
| 1929–62 [6] | | | | | | | | |
| $Y = a + b X$ | −11848.2580 | 113.1177 | -- | -- | 405.2068 | 3.5517 | -- | -- |
| $Y = a + b \log X$ [7] | −79828.7600 | 39116.3810 | -- | -- | 378.6564 | 1145.7752 | -- | -- |
| $\log Y = a + b \log X$ [7] | −4.5869 | 3.7925 | -- | -- | .0714 | .2160 | -- | -- |
| 1947–62 | | | | | | | | |
| $Y = a + b X$ | −10115.0720 | 102.7871 | -- | -- | 349.6643 | 6.6465 | -- | -- |
| $Y = a + b \log X$ [7] | −79320.7220 | 38881.6150 | -- | -- | 359.2803 | 2587.5637 | -- | -- |
| $\log Y = a + b \log X$ [7] | −1.7591 | 2.5203 | -- | -- | .0243 | .1752 | -- | -- |
| Container board consumption as a function of gross national product | | | | | | | | |
| 1929–62 [6] | | | | | | | | |
| $Y = a + b X$ | −1138.3668 | 18.4155 | -- | -- | 316.5947 | .4494 | -- | -- |
| $Y = a + b \log X$ [7] | −26481.7440 | 12666.8640 | -- | -- | 552.0936 | 548.1708 | -- | -- |
| $\log Y = a + b \log X$ [7] | .4568 | 1.2800 | -- | -- | .0416 | .0413 | -- | -- |
| 1947–62 | | | | | | | | |
| $Y = a + b X$ | −2074.2721 | 20.4735 | -- | -- | 288.8295 | 1.0835 | -- | -- |
| $Y = a + b \log X$ [7] | −44990.2770 | 19680.3940 | -- | -- | 357.2811 | 1301.9905 | -- | -- |
| $\log Y = a + b \log X$ [7] | .4258 | 1.2910 | -- | -- | .0193 | .0705 | -- | -- |

See footnotes at end of table.

*for use in projecting demand for container board*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .981 | .963 | 26 | 26.0 | 11,673 | 112.24 | 14,026 | 125.79 | 16,789 | 139.33 | 20,176 | 155.20 |
| .971 | .942 | 26 | 20.6 | 10,503 | 100.99 | 12,077 | 108.31 | 13,855 | 114.98 | 15,874 | 122.11 |
| .973 | .947 | 26 | 21.6 | 12,124 | 116.58 | 14,852 | 133.20 | 18,123 | 150.40 | 22,256 | 171.20 |
| .938 | .880 | 13 | 9.7 | 12,260 | 117.88 | 14,939 | 133.98 | 18,085 | 150.08 | 21,962 | 168.94 |
| .933 | .871 | 13 | 9.4 | 11,700 | 112.50 | 13,807 | 123.83 | 16,164 | 134.14 | 18,871 | 145.16 |
| .937 | .878 | 13 | 9.7 | 12,522 | 120.40 | 15,521 | 139.20 | 19,139 | 158.83 | 23,777 | 182.90 |
| 0.964 | 0.929 | 26 | 18.5 | 12,612 | [9] 403.57 | 15,274 | [9] 452.57 | 18,433 | [9] 501.57 | 22,442 | [9] 564.57 |
| .956 | .914 | 26 | 16.6 | 11,569 | [9] 370.21 | 13,520 | [9] 400.59 | 15,752 | [9] 428.62 | 18,354 | [9] 461.73 |
| .948 | .899 | 25 | 15.2 | 13,538 | [9] 433.20 | 16,966 | [9] 502.70 | 21,190 | [9] 576.60 | 26,962 | [9] 689.90 |
| .934 | .872 | 13 | 9.4 | 12,689 | [9] 406.06 | 15,368 | [9] 455.34 | 18,545 | [9] 504.62 | 22,577 | [9] 567.98 |
| .937 | .877 | 13 | 9.6 | 12,265 | [9] 392.47 | 14,493 | [9] 429.42 | 17,034 | [9] 463.51 | 20,025 | [9] 503.78 |
| .927 | .860 | 13 | 8.9 | 13,050 | [9] 417.60 | 16,106 | [9] 477.20 | 19,811 | [9] 539.80 | 24,812 | [9] 624.20 |
| .987 | .974 | 27 | 31.8 | 11,680 | 112.31 | 13,377 | 119.97 | 15,413 | 127.91 | 17,562 | 135.09 |
| .989 | .977 | 27 | 34.1 | 10,845 | 104.28 | 12,028 | 107.87 | 13,347 | 110.76 | 14,636 | 112.58 |
| .959 | .919 | 27 | 17.6 | 16,007 | 153.91 | 20,845 | 186.95 | 27,985 | 232.24 | 37,320 | 287.08 |
| .972 | .945 | 14 | 15.5 | 11,265 | 108.32 | 12,806 | 114.85 | 14,657 | 121.63 | 16,610 | 127.77 |
| .970 | .942 | 14 | 15.0 | 10,809 | 103.93 | 11,985 | 107.49 | 13,296 | 110.34 | 14,577 | 112.13 |
| .968 | .937 | 14 | 14.4 | 12,110 | 116.44 | 14,430 | 129.42 | 17,550 | 145.64 | 21,245 | 163.42 |
| .992 | .984 | 27 | 41.0 | 11,937 | 114.78 | 14,331 | 128.53 | 17,093 | 141.85 | 20,500 | 157.69 |
| .976 | .952 | 27 | 23.1 | 9,634 | 92.63 | 10,560 | 94.71 | 11,464 | 95.14 | 12,406 | 95.43 |
| .986 | .973 | 27 | 31.0 | 12,777 | 122.86 | 15,845 | 142.11 | 19,553 | 162.27 | 24,350 | 187.31 |
| .981 | .962 | 14 | 18.9 | 12,462 | 119.83 | 15,123 | 135.63 | 18,194 | 150.99 | 21,982 | 169.09 |
| .971 | .942 | 14 | 15.1 | 11,124 | 106.96 | 12,561 | 112.65 | 13,965 | 115.89 | 15,429 | 118.68 |
| .980 | .960 | 14 | 18.3 | 12,788 | 122.96 | 15,885 | 142.47 | 19,643 | 163.01 | 24,500 | 188.46 |

TABLE 3.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | | |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | $b^2$ | | $b$ | $b_1$ | $b^2$ |
| Container board consumption as a function of disposable personal income | | | | | | | | |
| 1929–62 [6] | | | | | | | | |
| $Y = a + b X$ | −1592.6565 | 28.2285 | -- | -- | 291.1712 | .6328 | -- | -- |
| $Y = a + b \log X$ [7] | −27971.7850 | 14109.1510 | -- | -- | 457.9136 | 502.4798 | -- | -- |
| $\log Y = a + b \log X$ [7] | .3344 | 1.4136 | -- | -- | .0426 | .0467 | -- | -- |
| 1947–62 | | | | | | | | |
| $Y = a + b X$ | −1751.0108 | 28.7119 | -- | -- | 288.3436 | 1.5169 | -- | -- |
| $Y = a + b \log X$ [7] | −41106.4990 | 19408.3710 | -- | -- | 318.6491 | 1138.0490 | -- | -- |
| $\log Y = a + b \log X$ [7] | .7038 | 1.2637 | -- | -- | .0199 | .0710 | -- | -- |
| Container board consumption as a function of industrial production | | | | | | | | |
| 1929–62 [6] | | | | | | | | |
| $Y = a + b X$ | −172.2853 | 77.6839 | -- | -- | 294.5435 | 1.7620 | -- | -- |
| $Y = a + b \log X$ [7] | −12732.8130 | 10036.2800 | -- | -- | 629.4833 | 499.0113 | -- | -- |
| $\log Y = a + b \log X$ [7] | 1.8279 | 1.0245 | -- | -- | .0377 | .0299 | -- | -- |
| 1947–62 | | | | | | | | |
| $Y = a + b X$ | −911.7008 | 85.5134 | -- | -- | 266.3816 | 4.1617 | -- | -- |
| $Y = a + b \log X$ [7] | −26313.2780 | 16999.3690 | -- | -- | 342.3904 | 1075.0662 | -- | -- |
| $\log Y = a + b \log X$ [7] | 1.6467 | 1.1173 | -- | -- | .0171 | .0538 | -- | -- |
| Container board consumption as a function of households | | | | | | | | |
| 1929–62 [6] | | | | | | | | |
| $Y = a + b X$ | −6848.3570 | 289.7546 | -- | -- | 347.3370 | 7.7711 | -- | -- |
| $Y = a + b \log X$ [7] | −37819.9350 | 26720.9530 | -- | -- | 410.0193 | 849.2219 | -- | -- |
| $\log Y = a + b \log X$ [7] | −.6101 | 2.6508 | -- | -- | .0511 | .1058 | -- | -- |
| 1947–62 | | | | | | | | |
| $Y = a + b X$ | −7514.9640 | 303.2789 | -- | -- | 378.9591 | 21.3633 | -- | -- |
| $Y = a + b \log X$ [7] | −47226.0780 | 32312.6460 | -- | -- | 416.1354 | 2517.4949 | -- | -- |
| $\log Y = a + b \log X$ [7] | .2981 | 2.1084 | -- | -- | .0258 | .1558 | -- | -- |
| Container board consumption as a function of population and per capita gross national product | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b X + b_1 X_1$ | −8914.4720 | 70.8388 | 1.5465 | -- | 281.7551 | 7.7444 | 0.2722 | -- |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −73518.5470 | 12361.5460 | 2129.3988 | -- | 309.0851 | 1087.4620 | 503.0040 | -- |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −8.1244 | 1.5420 | 1.1521 | -- | .1005 | .3536 | .1635 | -- |
| 1947–61 | | | | | | | | |
| $Y = a + b X + b_1 X_1$ | −9849.7550 | 65.1541 | 2.2496 | -- | 303.5642 | 15.7125 | .9769 | -- |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −90135.2110 | 11581.6830 | 4806.5009 | -- | 327.8958 | 2811.8247 | 2669.4995 | -- |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −7.2952 | 1.4398 | 1.1121 | -- | .0489 | .4196 | .3983 | -- |

See footnotes at end of table.

*for use in projecting demand for container board*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .993 | .987 | 27 | 44.6 | 12,522 | 120.40 | 15,062 | 135.09 | 17,885 | 148.42 | 21,555 | 165.81 |
| .983 | .967 | 27 | 28.1 | 10,108 | 97.19 | 11,123 | 99.76 | 12,082 | 100.27 | 13,140 | 101.08 |
| .986 | .971 | 27 | 30.2 | 14,117 | 135.74 | 17,835 | 159.96 | 22,225 | 184.69 | 28,405 | 218.50 |
| .981 | .962 | 14 | 18.9 | 12,605 | 121.20 | 15,189 | 136.22 | 18,060 | 149.88 | 21,793 | 167.64 |
| .977 | .954 | 14 | 17.1 | 11,276 | 108.42 | 12,671 | 113.64 | 13,991 | 116.11 | 15,446 | 118.82 |
| .979 | .958 | 14 | 17.8 | 13,017 | 125.16 | 16,043 | 143.88 | 19,557 | 162.30 | 24,320 | 187.08 |
| .993 | .986 | 27 | 44.1 | 11,480 | 110.38 | 13,422 | 120.38 | 15,753 | 130.73 | 18,472 | 142.09 |
| .968 | .937 | 27 | 20.1 | 9,107 | 87.57 | 9,779 | 87.70 | 10,469 | 86.88 | 11,156 | 85.82 |
| .989 | .978 | 27 | 34.3 | 11,410 | 109.71 | 13,363 | 119.85 | 15,713 | 130.40 | 18,466 | 142.05 |
| .984 | .968 | 14 | 20.5 | 11,915 | 114.57 | 14,053 | 126.04 | 16,619 | 137.92 | 19,612 | 150.86 |
| .973 | .947 | 14 | 15.8 | 10,679 | 102.68 | 11,817 | 105.98 | 12,985 | 107.76 | 14,149 | 108.84 |
| .984 | .969 | 14 | 20.8 | 11,968 | 115.08 | 14,217 | 127.51 | 16,967 | 140.80 | 20,235 | 155.65 |
| 0.990 | 0.981 | 27 | 37.3 | 11,261 | 108.28 | 12,710 | 113.99 | 14,449 | 119.91 | 16,187 | 124.52 |
| .987 | .973 | 27 | 31.5 | 10,168 | 97.77 | 11,061 | 99.20 | 12,049 | 99.99 | 12,960 | 99.69 |
| .979 | .959 | 27 | 25.1 | 14,140 | 135.96 | 17,340 | 155.52 | 21,730 | 180.33 | 26,755 | 205.81 |
| .967 | .935 | 14 | 14.2 | 11,440 | 110.00 | 12,956 | 116.20 | 14,776 | 122.62 | 16,596 | 127.66 |
| .960 | .922 | 14 | 12.8 | 10,804 | 103.88 | 11,883 | 106.57 | 13,079 | 108.54 | 14,180 | 109.08 |
| .964 | .929 | 14 | 13.5 | 12,148 | 116.81 | 14,290 | 128.16 | 17,100 | 141.91 | 20,175 | 155.19 |
| .993 | .987 | 25 | 33.6 | 11,094 | 106.67 | 12,697 | 113.87 | 14,514 | 120.45 | 16,494 | 126.88 |
| .992 | .984 | 25 | 18.6 | 9,783 | 94.07 | 10,852 | 97.33 | 12,001 | 99.59 | 13,142 | 101.09 |
| .985 | .970 | 25 | 19.8 | 13,066 | 125.63 | 16,281 | 146.02 | 20,333 | 168.74 | 25,503 | 196.18 |
| .976 | .953 | 12 | 5.7 | 11,373 | 109.36 | 13,138 | 117.83 | 15,098 | 125.29 | 17,259 | 132.76 |
| .972 | .945 | 12 | 3.5 | 10,781 | 103.66 | 12,057 | 108.13 | 13,384 | 111.07 | 14,720 | 113.23 |
| .974 | .950 | 12 | 8.4 | 12,532 | 120.50 | 15,600 | 139.91 | 19,068 | 158.24 | 23,642 | 181.86 |

TABLE 3.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | | |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | $b^2$ | | $b$ | $b_1$ | $b^2$ |
| Container board consumption as a function of population and per capita disposable personal income | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −8877.4670 | 63.3372 | 2.9057 | -- | 281.4806 | 8.9850 | .5106 | -- |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −74515.2960 | 11796.1000 | 2821.3484 | -- | 306.0409 | 1207.2926 | 651.0508 | -- |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −8.7408 | 1.2784 | 1.4711 | -- | .1050 | .4141 | .2233 | -- |
| 1947–61 | | | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −9155.2630 | 3.5043 | 8.5045 | -- | 275.3410 | 32.0780 | 2.8299 | -- |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −106625.2600 | 1409.7226 | 14169.4900 | -- | 306.4255 | 6433.9359 | 6068.0915 | -- |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | −10.5118 | −.6231 | 3.0008 | -- | .0451 | .9472 | .8933 | -- |
| Container board consumption as a function of population and industrial production | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −3934.1344 | 36.4120 | 52.4955 | -- | 240.9548 | 10.6276 | 7.1897 | -- |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −55802.9270 | 10881.3570 | 1583.0330 | -- | 275.3668 | 1143.4868 | 293.5761 | -- |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | .8600 | .8416 | .8145 | -- | .0825 | .3424 | .0879 | -- |
| 1947–61 | | | | | | | | |
| $Y = a + b\,X + b_1 X_1$ | −3653.0040 | 31.9935 | 57.2394 | -- | 248.1395 | 18.5223 | 15.3554 | -- |
| $Y = a + b \log X + b_1 \log X_1$ [8] | −45415.3140 | 6304.6285 | 4463.2185 | -- | 270.3714 | 3209.3686 | 1382.8170 | -- |
| $\log Y = a + b \log X + b_1 \log X_1$ [8] | 2.0237 | .5521 | .8830 | -- | .0383 | .4543 | .1957 | -- |
| Container board consumption as a function of population, per capita disposable personal income, and industrial production | | | | | | | | |
| 1929–61 [6] | | | | | | | | |
| $Y = a + b\,X + b_1 X_1 + b_2 X_2$ | −4162.7180 | 37.2649 | .1882 | 49.7112 | 245.7488 | 11.7811 | 1.0188 | 16.7591 |
| $Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$ [8] | −45957.9620 | 10861.9620 | −1819.9824 | 2449.2462 | 275.6772 | 1144.9380 | 1872.5636 | 938.4485 |
| $\log Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$ [8] | 4.1278 | .8208 | −.5916 | 1.0988 | .0816 | .3426 | .5320 | 0.2672 |
| 1947–61 | | | | | | | | |
| $Y = a + b\,X + b_1 X_1 + b_2 X_2$ | −4875.1980 | 16.2518 | 2.7616 | 44.2446 | 254.1967 | 30.4926 | 4.1876 | 25.2132 |
| $Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$ [8] | −55926.6570 | 4424.8261 | 3028.6230 | 3883.6883 | 280.6904 | 6122.7449 | 8276.0678 | 2137.4736 |
| $\log Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$ [8] | −2.7443 | −.0238 | 1.2207 | .5614 | .0390 | .7666 | 1.1242 | .3111 |

See footnotes at end of table.

*for use in projecting demand for container board*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .993 | .987 | 25 | 33.7 | 11,270 | 108.37 | 12,889 | 115.60 | 14,697 | 121.97 | 16,729 | 128.68 |
| .992 | .984 | 25 | 19.5 | 10,406 | 100.06 | 11,486 | 103.01 | 12,638 | 104.88 | 13,801 | 106.16 |
| .983 | .967 | 25 | 9.9 | 13,802 | 132.71 | 17,260 | 154.80 | 21,549 | 178.83 | 27,325 | 210.19 |
| .980 | .961 | 12 | .01 | 11,984 | 115.23 | 13,993 | 125.50 | 16,012 | 132.88 | 18,503 | 142.33 |
| .976 | .952 | 12 | .01 | 11,183 | 107.53 | 12,578 | 112.81 | 13,876 | 115.15 | 15,329 | 117.92 |
| .978 | .957 | 12 | .5 | 13,607 | 130.84 | 17,145 | 153.77 | 21,008 | 174.34 | 26,649 | 204.99 |
| .995 | .990 | 25 | 12.2 | 11,514 | 110.71 | 13,372 | 119.93 | 15,603 | 129.49 | 18,132 | 139.48 |
| .994 | .987 | 25 | 30.2 | 10,209 | 98.16 | 11,210 | 100.54 | 12,306 | 102.12 | 13,381 | 102.93 |
| .990 | .980 | 25 | 6.3 | 12,498 | 120.17 | 15,024 | 134.74 | 18,244 | 151.40 | 22,111 | 170.08 |
| 0.984 | 0.968 | 12 | 3.2 | 11,588 | 111.42 | 13,498 | 121.06 | 15,792 | 131.05 | 18,403 | 141.56 |
| .981 | .962 | 12 | 4.2 | 10,599 | 101.91 | 11,726 | 105.17 | 12,922 | 107.24 | 14,104 | 108.49 |
| .984 | .969 | 12 | 1.6 | 12,028 | 115.65 | 14,321 | 128.44 | 17,190 | 142.66 | 20,602 | 158.48 |
| .995 | .990 | 24 | .04 | 11,497 | 110.55 | 13,342 | 119.66 | 15,547 | 129.02 | 18,049 | 138.84 |
| .994 | .988 | 24 | 1.0 | 10,125 | 97.36 | 11,092 | 99.48 | 12,171 | 101.00 | 13,208 | 101.60 |
| .990 | .981 | 24 | 1.0 | 12,210 | 117.40 | 14,507 | 130.11 | 17,505 | 145.27 | 20,944 | 161.11 |
| .985 | .970 | 11 | .3 | 11,770 | 113.17 | 13,755 | 123.36 | 16,010 | 132.86 | 18,654 | 143.49 |
| .981 | .963 | 11 | .6 | 10,723 | 103.11 | 11,907 | 106.79 | 13,119 | 108.87 | 14,355 | 110.42 |
| .985 | .970 | 11 | .0 | 12,615 | 121.30 | 15,355 | 137.71 | 18,554 | 153.98 | 22,723 | 174.79 |

TABLE 3.—*Statistical measures obtained from regression equations tested*

| Variable, time period, and regression equation | Regression coefficients | | | | Standard error of estimate[1] | Standard errors of b coefficients[2] | | |
|---|---|---|---|---|---|---|---|---|
| | $a$ | $b$ | $b_1$ | $b_2$ | | $b$ | $b_1$ | $b_2$ |
| Container board consumption as a function of households, average disposable personal income per household, and industrial production | | | | | | | | |
| 1929–61[6] | | | | | | | | |
| $Y = a + b X + b_1 X_1 + b_2 X_2$ | −2482.1949 | 109.9423 | −.0593 | 49.4794 | 244.1742 | 38.2723 | .2646 | 16.0928 |
| $Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$[8] | −49030.7600 | 9005.1594 | 2361.1720 | 111.1927 | 340.4326 | 1274.9057 | 1964.9990 | 953.9948 |
| $\log Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$[8] | 8.2021 | .7539 | −.7827 | 1.0133 | .0698 | .2649 | .3933 | .1946 |
| 1947–61 | | | | | | | | |
| $Y = a + b X + b_1 X_1 + b_2 X_2$ | −6304.5140 | 16.6691 | 1.3392 | 43.1123 | 232.6201 | 58.1853 | .6157 | 18.4714 |
| $Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$[8] | −86874.9260 | 1115.0564 | 8445.5017 | 3456.5150 | 251.6838 | 2845.6979 | 3471.7590 | 1643.0048 |
| $\log Y = a + b \log X + b_1 \log X_1 + b_2 \log X_2$[8] | −3.9867 | .0217 | 1.0975 | .6934 | .0367 | .4070 | .5214 | .2275 |

[1] A measure of the closeness with which values of a dependent variable can be estimated from the values of an independent variable.

[2] A measure of the closeness with which the true values of the regression coefficients can be estimated from the values in the sample.

[3] A measure of the degree of relationship between the dependent and independent variables.

[4] A measure of the percent of the variation in the values of the dependent variable that is associated with variation in values of the independent variable.

[5] A measure of the probability that the given values of $b$ might have been obtained by chance from a population in which the true regression coefficient is zero.

[6] Excepting the war years 1942–46.

[7] Expressed in common logarithms.

[8] Expressed in natural logarithms.

[9] Pounds per household.

*for use in projecting demand for container board*—Continued

| Coefficient or index of correlation[3] | Coefficient or index of determination[4] | Degrees of freedom | F or t ratios[5] | Projected demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1970 | | 1975 | | 1980 | | 1985 | |
| | | | | Total | Per capita | Total | Per capita | Total | Per capita | Total | Per capita |
| | | | | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* | *Thousand tons* | *Pounds* |
| .995 | .990 | 24 | .1 | 11,337 | 109.01 | 13,082 | 117.33 | 15,184 | 126.01 | 17,522 | 134.78 |
| .991 | .981 | 24 | .01 | 9,985 | 96.01 | 10,893 | 97.70 | 11,860 | 98.42 | 12,800 | 98.46 |
| .993 | .986 | 24 | 4.1 | 11,644 | 111.96 | 13,510 | 121.17 | 15,916 | 132.08 | 18,442 | 141.86 |
| .987 | .975 | 11 | .1 | 11,918 | 114.60 | 14,016 | 125.70 | 16,347 | 135.66 | 19,161 | 147.39 |
| .985 | .970 | 11 | .2 | 10,957 | 105.36 | 12,284 | 110.17 | 13,579 | 112.69 | 14,984 | 115.26 |
| .987 | .974 | 11 | .0 | 12,591 | 121.07 | 15,389 | 138.02 | 18,732 | 155.45 | 23,142 | 178.02 |

TABLE 4.—*Measures of population and economic growth, 1920–85*

| Year | Population | Households | Gross national product (1961 prices) | | Disposable personal income (1961 prices) | | Index of industrial production | Construction expenditures (1961 prices) | Number of housing starts |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Per capita | Total | Per capita | | | |
| | *Millions* | *Millions* | *Billion dollars* | *Dollars* | *Billion dollars* | *Dollars* | *(1957–59 =100)* | *Billion dollars* | *Thousands* |
| 1920 | 106.5 | 24.5 | 142.8 | 1,340 | -- | -- | 26.2 | 19.1 | -- |
| 1925 | 115.8 | 27.5 | 179.5 | 1,550 | -- | -- | 31.5 | 39.8 | -- |
| 1930 | 123.1 | 30.0 | 191,7 | 1,560 | 144.4 | 1,170 | 32.0 | 34.3 | -- |
| 1935 | 127.3 | 31.9 | 177.4 | 1,390 | 136.9 | 1,080 | 30.7 | 22.4 | -- |
| 1940 | 132.1 | 34.9 | 237.6 | 1,800 | 172.8 | 1,310 | 43.9 | 34.5 | -- |
| 1945 | 139.9 | 37.5 | 371.7 | 2,660 | 238.7 | 1,710 | 70.5 | 23.8 | -- |
| 1950 | 152.3 | 43.6 | 371.6 | 2,440 | 259.4 | 1,700 | 74.9 | 61.8 | 1,726 |
| 1955 | 165.9 | 47.9 | 458.1 | 2,760 | 308.3 | 1,860 | 96.6 | 72.4 | 1,643 |
| 1960 | 180.7 | 52.8 | 510.2 | 2,820 | 353.4 | 1,960 | 108.7 | 73.9 | 1,296 |
| 1961 | 183.8 | 53.5 | 520.1 | 2,830 | 364.4 | 1,980 | 109.8 | 75.2 | 1,365 |
| 1962 | 186.7 | 54.7 | 554.3 | 2,970 | 381.9 | 2,050 | 118.3 | 78.3 | 1,492 |
| 1963 | 189.4 | 55.2 | 575.3 | 3,040 | 395.4 | 2,090 | 124.3 | 79.9 | 1,641 |
| 1964 [1] | 192.1 | 56.0 | 604.1 | 3,140 | 422.4 | 2,200 | 132.0 | 82.4 | 1,591 |
| PROJECTIONS | | | | | | | | | |
| 1970 | 208 | 62.5 | 710 | 3,410 | 500 | 2,400 | 150 | 98 | 1,630 |
| 1975 | 223 | 67.5 | 840 | 3,770 | 590 | 2,650 | 175 | 110 | 1,770 |
| 1980 | 241 | 73.5 | 990 | 4,110 | 690 | 2,860 | 205 | 125 | 1,920 |
| 1985 | 260 | 79.5 | 1,175 | 4,520 | 820 | 3,150 | 240 | 140 | 2,080 |

[1] Preliminary.

Sources: Population, U.S. Department of Commerce, Bureau of the Census. *Population estimates.* Cur. Pop. Rpt. Ser. P–25, 302. 1965. Households, U.S. Department of Commerce, Bureau of the Census. *Historical statistics of the United States, colonial times to 1957.* 1960, and *Population characteristics* Cur. Pop. Rpt. Ser. P–20, 140. 1965.

Gross national product, derived from data published by the U.S. Congress, Joint Committee on the Economic Report. *Potential economic growth of the United States during the next decade.* 83d Cong., 2d sess., 1954, and the U.S. Department of Commerce, Office of Business Economics. *Surv. Cur. Bus.,* 45 (8), 1965.

Disposable personal income, derived from data published by the U. S. Department of Commerce, Office of Business Economics, op. cit.

Index of industrial production, Board of Governors of the Federal Reserve System. *Industrial production 1957–59 base,* and the Council of Economic Advisors. *Economic indicators.* Monthly.

Construction expenditures, derived from data publishd by the U.S. Departments of Labor and Commerce. *Construction volume and costs 1915–1956.* Construct. Rev. 1958, and the U.S. Department of Commerce, Bureau of the Census. *Construction activity.* Construct. Rpts. C30. Monthly.

Housing starts, U.S. Department of Commerce, Bureau of the Census. *Housing starts.* Construct. Rpts. C20. Monthly, and U.S. Department of Agriculture, Forest Service.

Projections, U.S. Department of Agriculture, Forest Service.

# APPENDIX C

## Prices, Population, and Economic Activity

### Appendix C Contents

TABLE 1.—*Wholesale price indexes of selected grades of paper in the United States, 1926–66*
[1957–59 = 100]

| Year | All paper | | All paper except newsprint | | Newsprint | | Printing paper | | Book paper [1] | | Writing paper | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Actual | Relative [2] | Actual | Relative [2] | Actual | Relative [2] | Actual | Relative [2] | Actual | Relative [2] | Actual | Relative [2] |
| 1926 | 49.5 | 90.3 | -- | -- | 54.0 | 98.5 | -- | -- | -- | -- | -- | -- |
| 1927 | 45.2 | 86.4 | -- | -- | 54.0 | 103.3 | -- | -- | -- | -- | -- | -- |
| 1928 | 44.8 | 84.5 | -- | -- | 50.9 | 96.0 | -- | -- | -- | -- | -- | -- |
| 1929 | 44.0 | 84.5 | -- | -- | 46.7 | 89.6 | -- | -- | -- | -- | -- | -- |
| 1930 | 43.9 | 92.8 | -- | -- | 46.7 | 98.7 | -- | -- | -- | -- | -- | -- |
| 1931 | 42.5 | 106.5 | -- | -- | 42.9 | 107.5 | -- | -- | -- | -- | -- | -- |
| 1932 | 39.8 | 111.8 | -- | -- | 38.2 | 107.3 | -- | -- | -- | -- | -- | -- |
| 1933 | 37.9 | 105.0 | -- | -- | 31.1 | 86.1 | -- | -- | -- | -- | -- | -- |
| 1934 | 39.6 | 96.6 | -- | -- | 30.1 | 73.4 | -- | -- | -- | -- | -- | -- |
| 1935 | 39.8 | 90.9 | -- | -- | 30.1 | 68.7 | -- | -- | -- | -- | -- | -- |
| 1936 | 40.0 | 90.5 | -- | -- | 30.9 | 69.9 | -- | -- | -- | -- | -- | -- |
| 1937 | 42.5 | 90.0 | -- | -- | 32.0 | 67.8 | -- | -- | -- | -- | -- | -- |
| 1938 | 43.3 | 100.7 | -- | -- | 37.6 | 87.4 | -- | -- | -- | -- | -- | -- |
| 1939 | 42.3 | 100.2 | -- | -- | 37.6 | 89.1 | -- | -- | -- | -- | -- | -- |
| 1940 | 44.3 | 103.0 | -- | -- | 37.6 | 87.4 | -- | -- | -- | -- | -- | -- |
| 1941 | 46.5 | 97.3 | -- | -- | 37.6 | 78.7 | -- | -- | -- | -- | -- | -- |
| 1942 | 47.7 | 88.3 | -- | -- | 37.6 | 69.6 | -- | -- | -- | -- | -- | -- |
| 1943 | 49.0 | 86.7 | -- | -- | 41.1 | 72.7 | -- | -- | -- | -- | -- | -- |
| 1944 | 50.0 | 87.9 | -- | -- | 43.7 | 76.8 | -- | -- | -- | -- | -- | -- |
| 1945 | 50.5 | 87.2 | -- | -- | 45.4 | 78.4 | -- | -- | -- | -- | -- | -- |
| 1946 | 55.2 | 83.5 | -- | -- | 54.3 | 82.1 | -- | -- | -- | -- | -- | -- |
| 1947 | 65.5 | 80.7 | 65.3 | 80.4 | 65.9 | 81.2 | 73.9 | 91.0 | 63.3 | 78.0 | 68.4 | 84.2 |
| 1948 | 72.1 | 82.0 | 71.9 | 81.8 | 72.7 | 82.7 | 77.6 | 88.3 | 67.7 | 77.0 | 72.5 | 82.5 |
| 1949 | 72.9 | 87.3 | 72.0 | 86.2 | 75.2 | 90.1 | 78.2 | 93.7 | 70.7 | 84.7 | 71.9 | 86.1 |
| 1950 | 74.7 | 86.1 | 74.3 | 85.6 | 75.7 | 87.2 | 78.6 | 90.6 | 73.0 | 84.1 | 78.4 | 90.3 |
| 1951 | 83.6 | 86.5 | 83.9 | 86.8 | 82.3 | 85.1 | 84.7 | 87.6 | 80.6 | 83.4 | 88.7 | 91.7 |
| 1952 | 87.0 | 92.6 | 86.0 | 91.5 | 89.6 | 95.3 | 89.6 | 95.3 | 84.6 | 90.0 | 90.1 | 95.5 |
| 1953 | 88.1 | 95.0 | 86.2 | 93.0 | 93.5 | 100.9 | 89.6 | 96.7 | 85.6 | 92.3 | 90.1 | 97.2 |
| 1954 | 88.9 | 95.7 | 87.1 | 93.8 | 93.6 | 100.8 | 89.6 | 96.4 | 86.3 | 92.9 | 87.6 | 94.3 |
| 1955 | 91.1 | 97.7 | 90.1 | 96.7 | 93.8 | 100.6 | 91.0 | 97.6 | 89.5 | 96.0 | 92.7 | 99.5 |
| 1956 | 96.4 | 100.2 | 96.2 | 100.0 | 96.9 | 100.7 | 93.8 | 97.5 | 95.4 | 99.2 | 96.0 | 99.8 |
| 1957 | 99.6 | 100.6 | 99.6 | 100.6 | 99.6 | 100.6 | 98.4 | 99.4 | 98.4 | 99.4 | 99.0 | 100.0 |
| 1958 | 99.8 | 99.4 | 99.7 | 99.3 | 100.2 | 99.8 | 100.0 | 99.6 | 99.7 | 99.3 | 100.4 | 100.0 |
| 1059 | 100.6 | 100.0 | 100.7 | 100.1 | 100.2 | 99.6 | 101.6 | 101.0 | 101.9 | 101.3 | 100.6 | 100.0 |
| 1960 | 102.0 | 101.3 | 102.7 | 102.0 | 100.2 | 99.5 | 102.6 | 101.9 | 105.5 | 104.8 | 101.7 | 101.0 |
| 1961 | 102.2 | 101.9 | 102.9 | 102.6 | 100.2 | 99.9 | 101.4 | 101.1 | 106.1 | 105.8 | 101.8 | 101.5 |
| 1962 | 102.6 | 102.0 | 103.4 | 102.8 | 100.2 | 99.6 | 101.4 | 100.8 | 107.6 | 107.0 | 103.0 | 102.4 |
| 1963 | 102.4 | 102.1 | 103.2 | 102.9 | 100.2 | 99.9 | 101.4 | 101.1 | 107.4 | 107.1 | 104.2 | 103.9 |
| 1964 | 103.6 | 103.1 | 104.9 | 104.4 | 100.1 | 99.6 | 101.4 | 100.9 | 109.4 | 108.9 | 106.3 | 105.8 |
| 1965 | 104.1 | 101.6 | 106.1 | 103.5 | 98.7 | 96.3 | 101.4 | 98.9 | 110.6 | 107.9 | 109.2 | 106.5 |
| 1966 [3] | 107.3 | 101.3 | 109.4 | 103.3 | 101.6 | 95.9 | 101.7 | 96.0 | 115.1 | 108.7 | 113.2 | 106.9 |

[1] Book paper, A grade.
[2] Obtained by dividing the actual price index by the all commodity wholesale price index.
[3] Preliminary.
Source: U.S. Department of Labor, Bureau of Labor Statistics. *Wholesale prices and price indexes.* Monthly.

TABLE 2.—*Wholesale price indexes of selected grades of board in the United States, 1926–66*

[1957–59 = 100]

| Year | All board | | Container board | | Folding boxboard | | Building paper and board | |
|---|---|---|---|---|---|---|---|---|
| | Actual | Relative [1] | Actual | Relative [1] | Actual | Relative [1] | Actual | Relative [1] |
| 1926 | 36.9 | 67.3 | -- | -- | -- | -- | -- | -- |
| 1927 | 38.8 | 74.2 | -- | -- | -- | -- | -- | -- |
| 1928 | 35.8 | 67.5 | -- | -- | -- | -- | -- | -- |
| 1929 | 32.7 | 62.8 | -- | -- | -- | -- | -- | -- |
| 1930 | 27.4 | 57.9 | -- | -- | -- | -- | -- | -- |
| 1931 | 23.2 | 58.1 | -- | -- | -- | -- | -- | -- |
| 1932 | 23.1 | 64.9 | -- | -- | -- | -- | -- | -- |
| 1933 | 30.3 | 83.9 | -- | -- | -- | -- | -- | -- |
| 1934 | 34.8 | 84.9 | -- | -- | -- | -- | -- | -- |
| 1935 | 30.4 | 69.4 | -- | -- | -- | -- | -- | -- |
| 1936 | 30.5 | 69.0 | -- | -- | -- | -- | -- | -- |
| 1937 | 35.9 | 76.1 | -- | -- | -- | -- | -- | -- |
| 1938 | 30.4 | 70.7 | -- | -- | -- | -- | -- | -- |
| 1939 | 31.3 | 74.2 | -- | -- | -- | -- | -- | -- |
| 1940 | 35.7 | 83.0 | -- | -- | -- | -- | -- | -- |
| 1941 | 40.1 | 83.9 | -- | -- | -- | -- | -- | -- |
| 1942 | 41.2 | 76.3 | -- | -- | -- | -- | -- | -- |
| 1943 | 44.5 | 78.8 | -- | -- | -- | -- | -- | -- |
| 1944 | 45.5 | 80.0 | -- | -- | -- | -- | -- | -- |
| 1945 | 47.4 | 81.9 | -- | -- | -- | -- | -- | -- |
| 1946 | 52.1 | 78.8 | -- | -- | -- | -- | -- | -- |
| 1947 | 72.9 | 89.8 | 79.5 | 97.9 | 61.9 | 76.2 | 64.7 | 79.7 |
| 1948 | 74.9 | 85.2 | 80.1 | 91.1 | 65.4 | 74.4 | 71.6 | 81.5 |
| 1949 | 72.6 | 86.9 | 80.4 | 96.3 | 63.2 | 75.7 | 72.5 | 86.8 |
| 1950 | 77.1 | 88.8 | 82.2 | 94.7 | 69.6 | 80.2 | 74.9 | 86.3 |
| 1951 | 96.8 | 100.1 | 94.3 | 97.5 | 95.2 | 98.4 | 78.9 | 81.6 |
| 1952 | 93.6 | 99.6 | 92.5 | 98.4 | 91.9 | 97.8 | 80.3 | 85.4 |
| 1953 | 91.3 | 98.5 | 93.7 | 101.1 | 88.9 | 95.9 | 84.5 | 91.2 |
| 1954 | 91.4 | 98.4 | 95.9 | 103.2 | 87.8 | 94.5 | 88.9 | 95.7 |
| 1955 | 93.3 | 100.1 | 95.9 | 102.9 | 91.5 | 98.2 | 91.1 | 97.7 |
| 1956 | 99.0 | 102.9 | 98.9 | 102.8 | 98.4 | 102.3 | 95.3 | 99.1 |
| 1957 | 100.1 | 101.1 | 100.0 | 101.0 | 99.9 | 100.9 | 98.5 | 99.5 |
| 1958 | 100.0 | 99.6 | 100.0 | 99.6 | 100.1 | 99.7 | 99.7 | 99.3 |
| 1959 | 99.9 | 99.3 | 100.0 | 99.4 | 100.0 | 99.4 | 101.8 | 101.2 |
| 1960 | 99.4 | 98.7 | 99.6 | 98.9 | 99.3 | 98.6 | 101.4 | 100.7 |
| 1961 | 92.5 | 92.2 | 91.2 | 90.9 | 93.9 | 93.6 | 100.8 | 100.5 |
| 1962 | 93.1 | 92.5 | 92.4 | 91.8 | 93.6 | 93.0 | 97.2 | 96.6 |
| 1963 | 94.7 | 94.4 | 94.6 | 94.3 | 94.0 | 93.7 | 96.2 | 95.9 |
| 1964 | 96.4 | 95.9 | 97.5 | 97.0 | 93.6 | 93.1 | 94.2 | 93.7 |
| 1965 | 96.4 | 94.0 | 97.5 | 95.1 | 93.5 | 91.2 | 92.9 | 90.6 |
| 1966 [2] | 97.1 | 91.7 | 97.5 | 92.1 | 95.3 | 90.0 | 92.8 | 87.6 |

[1] Obtained by dividing the actual price index by the all commodity wholesale price index.
[2] Preliminary.
Source: See source note table 1.

TABLE 3.—*Wholesale price indexes of selected types of wood pulp in the United States, 1926–66*
[1957–59 = 100]

| Year | Wood pulp | | Bleached sulfite | | Unbleached sulfate | | Groundwood | | Bleached soda | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Actual | Relative [1] | Actual | Relative [1] | Actual | Relative [1] | Actual | Relative [1] | Actual | Relative [1] |
| 1926 | 37.5 | 68.4 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1927 | 34.7 | 66.3 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1928 | 33.3 | 62.8 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1929 | 33.2 | 63.7 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1930 | 32.4 | 68.5 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1931 | 30.1 | 75.4 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1932 | 24.1 | 67.7 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1933 | 24.5 | 67.9 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1934 | 29.4 | 71.7 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1935 | 27.1 | 61.9 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1936 | 28.2 | 63.8 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1937 | 43.7 | 92.6 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1938 | 32.1 | 74.7 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1939 | 27.6 | 65.4 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1940 | 42.1 | 97.9 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1941 | 46.5 | 97.3 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1942 | 48.3 | 89.4 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1943 | 48.3 | 85.5 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1944 | 52.2 | 91.7 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1945 | 52.7 | 91.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1946 | 58.3 | 88.2 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1947 | 79.4 | 97.8 | 79.0 | 97.3 | 80.9 | 99.6 | 91.2 | 112.3 | 79.9 | 98.4 |
| 1948 | 89.1 | 101.4 | 84.8 | 96.5 | 92.7 | 105.5 | 95.6 | 108.8 | 88.5 | 100.7 |
| 1949 | 80.6 | 96.5 | 80.4 | 96.3 | 73.5 | 88.0 | 82.0 | 98.2 | 81.6 | 97.7 |
| 1950 | 79.4 | 91.5 | 79.8 | 91.9 | 72.9 | 84.0 | 80.3 | 92.5 | 80.5 | 92.7 |
| 1951 | 95.0 | 98.2 | 91.1 | 94.2 | 99.4 | 102.8 | 109.5 | 113.2 | 94.1 | 97.3 |
| 1952 | 92.6 | 98.5 | 91.1 | 96.9 | 90.6 | 96.4 | 105.9 | 112.7 | 94.1 | 100.1 |
| 1953 | 90.6 | 97.7 | 91.1 | 98.3 | 80.2 | 86.5 | 98.6 | 106.4 | 94.1 | 101.5 |
| 1954 | 91.1 | 98.1 | 91.1 | 98.1 | 84.3 | 90.7 | 94.3 | 101.5 | 94.1 | 101.3 |
| 1955 | 93.8 | 100.6 | 93.6 | 100.4 | 94.5 | 101.4 | 91.4 | 98.1 | 95.3 | 102.3 |
| 1956 | 97.8 | 101.7 | 97.6 | 101.5 | 99.2 | 103.1 | 100.0 | 104.0 | 97.5 | 101.4 |
| 1957 | 98.7 | 99.7 | 98.4 | 99.4 | 100.0 | 101.0 | 100.0 | 101.0 | 98.3 | 99.3 |
| 1958 | 100.7 | 100.3 | 100.8 | 100.4 | 100.0 | 99.6 | 100.0 | 99.6 | 100.8 | 100.4 |
| 1959 | 100.7 | 100.1 | 100.8 | 100.2 | 100.0 | 99.4 | 100.0 | 99.4 | 100.8 | 100.2 |
| 1960 | 100.2 | 99.5 | 100.0 | 99.3 | 100.0 | 99.3 | 100.0 | 99.3 | 100.1 | 99.4 |
| 1961 | 95.0 | 94.7 | 91.0 | 90.7 | 100.0 | 99.7 | 100.0 | 99.7 | 89.9 | 89.6 |
| 1962 | 93.2 | 92.6 | 90.2 | 89.7 | 98.8 | 98.2 | 100.0 | 99.4 | 87.7 | 87.2 |
| 1963 | 91.7 | 91.4 | 88.2 | 87.9 | 98.1 | 97.8 | 100.0 | 99.7 | 82.5 | 82.3 |
| 1964 | 96.1 | 95.6 | 92.8 | 92.3 | 102.9 | 102.4 | 100.0 | 99.5 | 86.1 | 85.7 |
| 1965 | 98.1 | 95.7 | 95.7 | 93.4 | 103.1 | 100.6 | 100.0 | 97.6 | 90.8 | 88.6 |
| 1966 [2] | 98.0 | 92.5 | 95.7 | 90.4 | 102.1 | 96.4 | 100.0 | 94.4 | 90.8 | 85.7 |

[1] Obtained by dividing the actual price index by the all commodity wholesale price index.
[2] Preliminary.
Source: See source note table 1.

TABLE 4.—*Pulpwood prices in the United States, by selected species, 1940–66*
[Dollars per standard cord, including bark]

| Year | Wisconsin | | | | Southeast | | | | Midsouth | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Roundwood | | | | | | | | Plant hyproducts | |
| | Spruce | | Aspen | | Southern pine | | Hardwoods | | Southern pine | | Hardwoods | | Southern pine | |
| | Current dollars | 1957–59 dollars | Current dollars | 1957–59 dollars | Current dollars | 1957–59 dollars | Current dollars | 1957–59 dollars | Current dollars | 1957–59 dollars | Current dollars | 1957–59 dollars | Current dollars | 1957–59 dollars |
| 1940 | 9.00 | 20.95 | 4.25 | 9.90 | 4.20 | 9.75 | -- | -- | 4.00 | 9.30 | -- | -- | -- | -- |
| 1941 | 10.50 | 21.95 | 4.75 | 9.95 | 4.60 | 9.60 | -- | -- | 4.90 | 10.25 | -- | -- | -- | -- |
| 1942 | 12.25 | 22.70 | 6.90 | 12.80 | 6.00 | 11.10 | -- | -- | 6.10 | 11.30 | -- | -- | -- | -- |
| 1943 | 14.75 | 26.10 | 8.75 | 15.50 | 7.20 | 12.75 | -- | -- | 7.40 | 13.10 | -- | -- | -- | -- |
| 1944 | 15.00 | 26.35 | 9.00 | 15.80 | 8.20 | 14.40 | -- | -- | 8.55 | 15.05 | -- | -- | -- | -- |
| 1945 | 15.00 | 25.90 | 9.60 | 16.60 | 8.40 | 14.50 | -- | -- | 9.00 | 15.55 | -- | -- | -- | -- |
| 1946 | 16.50 | 24.95 | 10.00 | 15.15 | 10.10 | 15.30 | -- | -- | 10.05 | 15.20 | -- | -- | -- | -- |
| 1947 | 23.75 | 29.25 | 11.50 | 14.15 | 11.00 | 13.55 | -- | -- | 11.20 | 13.80 | 10.15 | 12.50 | -- | -- |
| 1948 | 22.25 | 25.30 | 12.00 | 13.65 | 11.70 | 13.30 | -- | -- | 11.90 | 13.55 | 10.05 | 11.45 | -- | -- |
| 1949 | 18.50 | 22.15 | 9.25 | 11.10 | 11.00 | 13.15 | -- | -- | 11.55 | 13.85 | 9.35 | 11.20 | -- | -- |
| 1950 | 19.50 | 22.45 | 9.50 | 10.95 | 11.90 | 13.70 | -- | -- | 12.15 | 14.00 | 10.65 | 12.25 | -- | -- |
| 1951 | 22.50 | 23.25 | 10.50 | 10.85 | 13.80 | 14.25 | -- | -- | 14.25 | 14.75 | 13.00 | 13.45 | -- | -- |
| 1952 | 25.00 | 26.60 | 12.25 | 13.05 | 13.90 | 14.80 | -- | -- | 14.30 | 15.20 | 12.90 | 13.70 | -- | -- |
| 1953 | 23.25 | 25.10 | 12.00 | 12.95 | 13.90 | 15.00 | -- | -- | 14.25 | 15.35 | 12.80 | 13.80 | -- | -- |
| 1954 | 24.25 | 26.10 | 12.50 | 13.45 | 14.00 | 15.05 | -- | -- | 14.30 | 15.40 | 12.85 | 13.85 | -- | -- |
| 1955 | 24.75 | 26.55 | 11.50 | 12.35 | 14.40 | 15.45 | -- | -- | 14.60 | 15.65 | 12.90 | 13.85 | -- | -- |
| 1956 | 26.00 | 27.05 | 12.25 | 12.75 | 15.40 | 16.00 | -- | -- | 15.65 | 16.25 | 13.50 | 14.05 | -- | -- |
| 1957 | 26.00 | 26.25 | 11.75 | 11.85 | 15.50 | 15.65 | 13.35 | 13.50 | 15.30 | 15.45 | 13.35 | 13.50 | 14.25 | 14.40 |
| 1958 | 26.25 | 26.15 | 12.00 | 11.95 | 15.50 | 15.45 | 13.45 | 13.40 | 15.30 | 15.25 | 13.10 | 13.05 | 14.30 | 14.25 |
| 1959 | 26.25 | 26.10 | 11.50 | 11.45 | 16.00 | 15.90 | 13.70 | 13.60 | 15.70 | 15.60 | 13.10 | 13.00 | 14.30 | 14.20 |
| 1960 | 26.75 | 26.55 | 12.00 | 11.90 | 16.45 | 16.35 | 13.60 | 13.50 | 16.05 | 15.95 | 13.10 | 13.00 | 14.40 | 14.30 |
| 1961 | 27.25 | 27.15 | 13.00 | 12.95 | 16.55 | 16.50 | 13.50 | 13.45 | 15.85 | 15.80 | 13.05 | 13.00 | 14.50 | 14.45 |
| 1962 | 27.25 | 27.10 | 12.75 | 12.65 | 16.55 | 16.45 | 13.40 | 13.30 | 15.80 | 15.70 | 13.20 | 13.10 | 14.60 | 14.50 |
| 1963 | 25.75 | 25.65 | 13.75 | 13.70 | 16.55 | 16.50 | 13.45 | 13.40 | 15.75 | 15.70 | 13.10 | 13.05 | 14.40 | 14.35 |
| 1964 | -- | -- | -- | -- | 17.00 | 16.90 | 13.60 | 13.55 | 15.90 | 15.50 | 13.15 | 13.10 | 14.30 | 14.25 |
| 1965 | -- | -- | -- | -- | 17.65 | 17.20 | 14.35 | 14.00 | 16.30 | 15.90 | 13.80 | 13.45 | 14.40 | 14.05 |
| 1966 [1] | 30.75 | 29.05 | 15.50 | 14.65 | 17.75 | 16.75 | 14.50 | 13.70 | 17.00 | 16.05 | 14.50 | 13.70 | 15.00 | 14.15 |

[1] Preliminary.

Sources: Current dollars, University of Wisconsin, Extension Service College of Agriculture. *Wisconsin forest products price review.* U.S. Department of Agriculture. *U.S. Forest Service research note SE: pulpwood prices in the Southeast.* Annual, and *U.S. Forest Service research note SO: pulpwood price trends in the Midsouth.* Annual.

1957–59 dollars derived by dividing the price in current dollars by the wholesale price index of all commodities (1957–59=100) published by the U.S. Department of Labor, Bureau of Labor Statistics, op. cit.

TABLE 5.—*Measures of population and economic growth, 1920–66*

| Year | Population | Households | Gross national product (1961 prices) | | Disposable personal income (1961 prices) | | Index of industrial production | Construction expenditures (1961 prices) | Number of housing starts |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Per capita | Total | Per capita | | | |
| | *Millions* | *Millions* | *Billion dollars* | *Dollars* | *Billion dollars* | *Dollars* | *(1957–59 =100)* | *Billion dollars* | *Thousands* |
| 1920 | 106.5 | 24.5 | 142.8 | 1,340 | -- | -- | 26.2 | 19.1 | -- |
| 1921 | 108.5 | 25.1 | 129.4 | 1,190 | -- | -- | 20.1 | 22.6 | -- |
| 1922 | 110.1 | 25.7 | 148.1 | 1,350 | -- | -- | 25.6 | 30.1 | -- |
| 1923 | 112.0 | 26.3 | 166.2 | 1,480 | -- | -- | 30.5 | 32.0 | -- |
| 1924 | 114.1 | 26.9 | 165.7 | 1,450 | -- | -- | 28.6 | 35.8 | -- |
| 1925 | 115.8 | 27.5 | 179.5 | 1,550 | -- | -- | 31.5 | 39.8 | -- |
| 1926 | 117.4 | 28.1 | 189.3 | 1,610 | -- | -- | 33.4 | 42.1 | -- |
| 1927 | 119.0 | 28.6 | 189.8 | 1,590 | -- | -- | 33.3 | 42.7 | -- |
| 1928 | 120.5 | 29.1 | 192.7 | 1,600 | -- | -- | 34.6 | 41.9 | -- |
| 1929 | 121.8 | 29.6 | 212.9 | 1,750 | 156.4 | 1,280 | 38.4 | 39.1 | -- |
| 1930 | 123.1 | 30.0 | 191.7 | 1,560 | 144.4 | 1,170 | 32.0 | 34.3 | -- |
| 1931 | 124.0 | 30.3 | 177.0 | 1,430 | 138.9 | 1,120 | 26.5 | 29.0 | -- |
| 1932 | 124.8 | 30.4 | 150.7 | 1,210 | 119.6 | 960 | 20.7 | 21.6 | -- |
| 1933 | 125.6 | 30.8 | 148.0 | 1,180 | 116.5 | 930 | 24.4 | 17.4 | -- |
| 1934 | 126.4 | 31.3 | 161.4 | 1,280 | 125.1 | 990 | 26.6 | 19.7 | -- |
| 1935 | 127.3 | 31.9 | 177.4 | 1,390 | 136.9 | 1,080 | 30.7 | 22.4 | -- |
| 1936 | 128.1 | 32.5 | 201.8 | 1,580 | 154.2 | 1,200 | 36.3 | 30.5 | -- |
| 1937 | 128.8 | 33.1 | 212.6 | 1,650 | 159.1 | 1,240 | 39.7 | 29.7 | -- |
| 1938 | 129.8 | 33.7 | 201.8 | 1,550 | 149.2 | 1,150 | 31.4 | 29.7 | -- |
| 1939 | 130.9 | 34.4 | 219.0 | 1,670 | 162.0 | 1,240 | 38.3 | 33.6 | -- |
| 1940 | 132.1 | 34.9 | 237.6 | 1,800 | 172.8 | 1,310 | 43.9 | 34.5 | -- |
| 1941 | 133.4 | 35.9 | 275.8 | 2,070 | 197.7 | 1,480 | 56.4 | 42.0 | -- |
| 1942 | 134.9 | 36.4 | 311.5 | 2,310 | 221.7 | 1,640 | 69.3 | 43.0 | -- |
| 1943 | 136.7 | 36.8 | 352.7 | 2,580 | 231.5 | 1,690 | 82.9 | 28.0 | -- |
| 1944 | 138.4 | 37.1 | 377.9 | 2,730 | 240.6 | 1,740 | 81.7 | 21.7 | -- |
| 1945 | 139.9 | 37.5 | 371.7 | 2,660 | 238.7 | 1,710 | 70.5 | 23.8 | -- |
| 1946 | 141.4 | 38.4 | 326.9 | 2,310 | 235.8 | 1,670 | 59.5 | 41.9 | -- |
| 1947 | 144.1 | 39.1 | 324.1 | 2,250 | 226.5 | 1,570 | 65.7 | 46.9 | -- |
| 1948 | 146.6 | 40.5 | 338.5 | 2,310 | 238.8 | 1,630 | 68.4 | 52.6 | 1,265 |
| 1949 | 149.2 | 42.2 | 339.0 | 2,270 | 239.8 | 1,610 | 64.7 | 55.3 | 1,415 |
| 1950 | 152.3 | 43.6 | 371.6 | 2,440 | 259.4 | 1,700 | 74.9 | 61.8 | 1,726 |
| 1951 | 154.9 | 44.7 | 401.0 | 2,590 | 265.7 | 1,720 | 81.3 | 61.2 | 1,352 |
| 1952 | 157.6 | 45.5 | 413.2 | 2,620 | 273.6 | 1,740 | 84.3 | 62.0 | 1,392 |
| 1953 | 160.2 | 46.3 | 431.7 | 2,690 | 286.2 | 1,790 | 91.3 | 63.9 | 1,372 |
| 1954 | 163.0 | 46.9 | 425.7 | 2,610 | 289.2 | 1,770 | 85.8 | 66.8 | 1,507 |
| 1955 | 165.9 | 47.9 | 458.1 | 2,760 | 308.3 | 1,860 | 96.6 | 72.4 | 1,643 |
| 1956 | 168.9 | 48.9 | 466.6 | 2,760 | 321.3 | 1,900 | 99.9 | 71.0 | 1,405 |
| 1957 | 172.0 | 49.7 | 473.2 | 2,750 | 328.1 | 1,910 | 100.7 | 71.1 | 1,240 |
| 1958 | 174.9 | 50.5 | 467.8 | 2,670 | 331.3 | 1,890 | 93.7 | 70.9 | 1,380 |
| 1959 | 177.8 | 51.4 | 497.7 | 2,800 | 346.0 | 1,950 | 105.6 | 76.1 | 1,554 |
| 1960 | 180.7 | 52.8 | 510.2 | 2,820 | 353.4 | 1,960 | 108.7 | 73.9 | 1,296 |
| 1961 | 183.8 | 53.5 | 520.1 | 2,830 | 364.4 | 1,980 | 109.7 | 75.2 | 1,365 |
| 1962 | 186.7 | 54.7 | 554.1 | 2,970 | 382.0 | 2,050 | 118.3 | 78.3 | 1,492 |
| 1963 | 189.4 | 55.2 | 576.3 | 3,040 | 396.2 | 2,090 | 124.3 | 79.9 | 1,641 |
| 1964 | 192.1 | 56.0 | 606.6 | 3,160 | 422.4 | 2,200 | 132.3 | 82.4 | 1,591 |
| 1965 | 194.6 | 57.3 | 642.6 | 3,300 | 447.6 | 2,300 | 143.4 | 86.5 | 1,543 |
| 1966 [1] | 196.8 | 58.1 | 678.6 | 3,450 | 463.5 | 2,360 | 155.7 | 86.7 | 1,252 |

[1] Preliminary.

Sources: Population, U.S. Department of Commerce, Bureau of the Census. *Population estimates.* Cur. Pop. Rpts. Ser. P–25, 333 and 355. 1966.

Households, U.S. Department of Commerce, Bureau of the Census. *Historical statistics of the United States, colonial times to 1957.* 1960, and *Population characteristics.* Cur. Pop. Rpt. Ser. P–20, 152. 1966.

Gross national product, derived from data published by the U.S. Congress, Joint Committee on the Economic Report. *Potential economic growth of the United States during the next decade.* 83d Cong., 2d sess., 1954; the U.S. Department of Commerce, Office of Business Economics. *Surv. Cur. Bus.,* 45 (8) 1965; and the Council of Economic Advisors. *Economic indicators.* Monthly.

Disposable personal income, derived from data published by the U.S. Department of Commerce, Office of Business Economics, op. cit., and the Council of Economic Advisors, op. cit.

Index of industrial production, Board of Governors of the Federal Reserve System. *Industrial production 1957–59 base,* and the Council of Economic Advisors, op. cit.

Construction expenditures, derived from data published by the U.S. Departments of Labor and Commerce, *Construction volume and costs 1915–1956.* Construct. Rev. 1958, and the U.S. Department of Commerce, Bureau of the Census, *Construction activity.* Construct. Rpts. C30. Monthly.

Housing starts, U.S. Department of Commerce, Bureau of the Census. *Housing starts.* Construct. Rpts. C20. Monthly, and U.S. Department of Agriculture, Forest Service.

# APPENDIX D

## Production, Trade, and Consumption of Major Grades of Paper and Board

[Note: The preliminary data for 1965 and 1966 in this appendix were based on information available at the end of February, 1967.]

### Appendix D Contents

TABLE 1.—*Paper and board production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption [2] | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 7,185 | 778 | 219 | 7,744 | 145 |
| 1921 | 5,333 | 819 | 91 | 6,061 | 112 |
| 1922 | 6,875 | 1,099 | 96 | 7,878 | 143 |
| 1923 | 7,871 | 1,423 | 86 | 9,208 | 164 |
| 1924 | 7,930 | 1,459 | 91 | 9,298 | 163 |
| 1925 | 9,002 | 1,528 | 92 | 10,437 | 180 |
| 1926 | 9,794 | 1,930 | 117 | 11,607 | 198 |
| 1927 | 10,002 | 2,065 | 113 | 11,954 | 201 |
| 1928 | 10,403 | 2,222 | 136 | 12,489 | 207 |
| 1929 | 11,140 | 2,485 | 179 | 13,421 | 220 |
| 1930 | 10,169 | 2,326 | 160 | 12,340 | 201 |
| 1931 | 9,382 | 2,105 | 124 | 11,400 | 184 |
| 1932 | 7,998 | 1,827 | 85 | 9,803 | 157 |
| 1933 | 9,190 | 1,828 | 98 | 10,869 | 173 |
| 1934 | 9,187 | 2,250 | 127 | 11,201 | 177 |
| 1935 | 10,479 | 2,438 | 139 | 12,820 | 201 |
| 1936 | 11,976 | 2,832 | 137 | 14,652 | 229 |
| 1937 | 12,837 | 3,401 | 177 | 15,653 | 243 |
| 1938 | 11,381 | 2,336 | 156 | 13,951 | 215 |
| 1939 | 13,510 | 2,683 | 198 | 15,982 | 244 |
| 1940 | 14,484 | 2,812 | 490 | 16,770 | 254 |
| 1941 | 17,762 | 3,056 | 399 | 20,386 | 306 |
| 1942 | 17,084 | 3,036 | 264 | 19,731 | 293 |
| 1943 | 17,036 | 2,717 | 255 | 19,644 | 287 |
| 1944 | 17,183 | 2,574 | 254 | 19,540 | 282 |
| 1945 | 17,371 | 2,751 | 396 | 19,827 | 283 |
| 1946 | 19,278 | 3,622 | 305 | 22,550 | 319 |
| 1947 | 21,114 | 4,116 | 352 | 24,775 | 344 |
| 1948 | 21,897 | 4,575 | 295 | 26,070 | 356 |
| 1949 | 20,315 | 4,746 | 295 | 24,781 | 332 |
| 1950 | 24,375 | 4,998 | 297 | 29,108 | 382 |
| 1951 | 26,047 | 5,139 | 528 | 30,530 | 394 |
| 1952 | 24,418 | 5,173 | 499 | 28,971 | 368 |
| 1953 | 26,605 | 5,215 | 383 | 31,520 | 394 |
| 1954 | 26,876 | 5,182 | 591 | 31,516 | 387 |
| 1955 | 30,178 | 5,463 | 736 | 34,979 | 422 |
| 1956 | 31,441 | 5,844 | 669 | 36,386 | 431 |
| 1957 | 30,666 | 5,438 | 751 | 35,280 | 410 |
| 1958 | 30,823 | 5,120 | 728 | 35,248 | 403 |
| 1959 | 34,036 | 5,579 | 793 | 38,793 | 436 |
| 1960 | 34,444 | 5,715 | 897 | 39,295 | 435 |
| 1961 | 35,698 | 5,754 | 1,042 | 40,461 | 440 |
| 1962 | 37,543 | 5,821 | 1,001 | 42,345 | 454 |
| 1963 | 39,231 | 5,762 | 1,149 | 43,913 | 464 |
| 1964 | 41,748 | 6,351 | 1,496 | 46,562 | 485 |
| 1965 [3] | 43,846 | 6,770 | 1,639 | 48,900 | 503 |
| 1966 [3] | 46,741 | 7,495 | 1,799 | 52,298 | 531 |

[1] Data may not add to total because of rounding.

[2] Includes changes in newsprint stocks beginning in 1929.

[3] Preliminary.

Sources: American Paper Institute. *The statistics of paper.* Annual, 1960 ed. and 1965 sup., and *Monthly statistical summary* (3), New York; U.S. Department of Commerce Bureau of the Census. *Pulp, paper and board.* Cur. Indus. Rpts. Ser. M26A. Annual; U.S. Department of Commerce, Business and Defense Services Administration. *Pulp, paper and board.* Quart. Indus. Rpt; and U.S. Department of Agriculture, Forest Service.

TABLE 2.—*Paper production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption [2] | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 4,872 | 735 | 158 | 5,448 | 102 |
| 1921 | 3,594 | 799 | 66 | 4,327 | 80 |
| 1922 | 4,719 | 1,066 | 67 | 5,717 | 104 |
| 1923 | 5,078 | 1,372 | 52 | 6,397 | 114 |
| 1924 | 5,080 | 1,404 | 50 | 6,435 | 113 |
| 1925 | 5,715 | 1,476 | 60 | 7,131 | 123 |
| 1926 | 6,144 | 1,875 | 63 | 7,956 | 136 |
| 1927 | 6,228 | 2,016 | 57 | 8,188 | 138 |
| 1928 | 6,342 | 2,184 | 70 | 8,455 | 140 |
| 1929 | 6,776 | 2,445 | 93 | 9,101 | 149 |
| 1930 | 6,191 | 2,297 | 76 | 8,416 | 137 |
| 1931 | 5,604 | 2,085 | 55 | 7,671 | 124 |
| 1932 | 4,755 | 1,809 | 41 | 6,587 | 106 |
| 1933 | 5,182 | 1,810 | 49 | 6,893 | 110 |
| 1934 | 5,173 | 2,229 | 75 | 7,219 | 114 |
| 1935 | 5,855 | 2,413 | 77 | 8,234 | 129 |
| 1936 | 6,598 | 2,799 | 71 | 9,308 | 145 |
| 1937 | 7,109 | 3,363 | 94 | 9,969 | 155 |
| 1938 | 6,340 | 2,309 | 71 | 8,970 | 138 |
| 1939 | 7,484 | 2,654 | 97 | 10,029 | 153 |
| 1940 | 8,105 | 2,791 | 254 | 10,606 | 161 |
| 1941 | 9,362 | 3,019 | 264 | 12,084 | 181 |
| 1942 | 9,115 | 2,961 | 161 | 11,790 | 175 |
| 1943 | 8,415 | 2,663 | 182 | 11,043 | 162 |
| 1944 | 8,220 | 2,522 | 180 | 10,599 | 153 |
| 1945 | 8,457 | 2,700 | 255 | 11,004 | 157 |
| 1946 | 9,773 | 3,580 | 217 | 13,091 | 185 |
| 1947 | 10,705 | 4,057 | 214 | 14,445 | 200 |
| 1948 | 11,119 | 4,500 | 161 | 15,350 | 209 |
| 1949 | 10,350 | 4,676 | 181 | 14,859 | 199 |
| 1950 | 12,064 | 4,913 | 175 | 16,833 | 221 |
| 1951 | 13,010 | 5,025 | 277 | 17,630 | 228 |
| 1952 | 12,197 | 5,090 | 326 | 16,839 | 214 |
| 1953 | 12,739 | 5,091 | 189 | 17,724 | 221 |
| 1954 | 13,077 | 5,073 | 326 | 17,873 | 219 |
| 1955 | 14,503 | 5,259 | 414 | 19,422 | 234 |
| 1956 | 15,419 | 5,688 | 340 | 20,537 | 243 |
| 1957 | 14,909 | 5,308 | 387 | 19,757 | 230 |
| 1958 | 14,887 | 4,986 | 346 | 19,560 | 224 |
| 1959 | 16,506 | 5,392 | 329 | 21,540 | 242 |
| 1960 | 16,809 | 5,574 | 361 | 22,055 | 244 |
| 1961 | 17,224 | 5,605 | 405 | 22,474 | 245 |
| 1962 | 17,966 | 5,632 | 349 | 23,231 | 249 |
| 1963 | 18,752 | 5,537 | 382 | 23,976 | 253 |
| 1964 | 19,714 | 6,117 | 432 | 25,359 | 264 |
| 1965 [3] | 20,673 | 6,508 | 498 | 26,605 | 273 |
| 1966 [3] | 21,916 | 7,247 | 587 | 28,435 | 289 |

[1] Data may not add to total because of rounding.

[2] Includes changes in newsprint stocks beginning in 1929.

[3] Preliminary.

Sources: See source note table 1.

TABLE 3.—*Newsprint production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports into the United States [2] | | | U.S. exports | Consumption [3] | Production as a percent of consumption | Per capita consumption |
|---|---|---|---|---|---|---|---|---|
| | | Total | From Canada [4] | From Europe | | | | |
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Percent* | *Pounds* |
| 1920 | 1,512 | 730 | 680 | 51 | 46 | 2,196 | 68.9 | 41 |
| 1921 | 1,237 | 793 | 657 | 135 | 17 | 2,013 | 61.5 | 37 |
| 1922 | 1,448 | 1,029 | 896 | 133 | 26 | 2,451 | 59.1 | 45 |
| 1923 | 1,521 | 1,309 | 1,108 | 200 | 16 | 2,814 | 54.1 | 50 |
| 1924 | 1,481 | 1,357 | 1,201 | 156 | 17 | 2,821 | 52.5 | 49 |
| 1925 | 1,563 | 1,448 | 1,315 | 133 | 23 | 2,989 | 52.3 | 52 |
| 1926 | 1,684 | 1,851 | 1,751 | 100 | 19 | 3,516 | 47.9 | 60 |
| 1927 | 1,517 | 1,987 | 1,865 | 122 | 12 | 3,492 | 43.4 | 59 |
| 1928 | 1,415 | 2,157 | 2,041 | 116 | 11 | 3,561 | 39.7 | 59 |
| 1929 | 1,409 | 2,423 | 2,327 | 96 | 19 | 3,787 | 37.2 | 62 |
| 1930 | 1,226 | 2,280 | 2,145 | 134 | 10 | 3,501 | 35.0 | 57 |
| 1931 | 1,203 | 2,067 | 1,916 | 151 | 10 | 3,298 | 36.5 | 53 |
| 1932 | 1,047 | 1,792 | 1,647 | 145 | 8 | 2,895 | 36.2 | 46 |
| 1933 | 923 | 1,794 | 1,640 | 153 | 11 | 2,660 | 34.9 | 42 |
| 1934 | 990 | 2,210 | 2,063 | 147 | 23 | 3,068 | 32.3 | 49 |
| 1935 | 948 | 2,383 | 2,186 | 197 | 22 | 3,351 | 28.3 | 53 |
| 1936 | 938 | 2,752 | 2,509 | 242 | 15 | 3,657 | 25.6 | 57 |
| 1937 | 976 | 3,317 | 3,023 | 294 | 17 | 3,868 | 25.2 | 60 |
| 1938 | 832 | 2,275 | 2,031 | 243 | 6 | 3,492 | 23.8 | 54 |
| 1939 | 954 | 2,615 | 2,305 | 310 | 13 | 3,543 | 26.9 | 54 |
| 1940 | 1,056 | 2,763 | 2,729 | 34 | 44 | 3,739 | 28.2 | 57 |
| 1941 | 1,044 | 2,982 | 2,979 | 3 | 70 | 3,923 | 26.6 | 59 |
| 1942 | 967 | 2,921 | 2,920 | 2 | 42 | 3,722 | 26.0 | 55 |
| 1943 | 811 | 2,637 | 2,637 | -- | 35 | 3,559 | 22.8 | 52 |
| 1944 | 721 | 2,491 | 2,491 | -- | 31 | 3,218 | 22.4 | 47 |
| 1945 | 725 | 2,669 | 2,669 | -- | 44 | 3,452 | 21.0 | 49 |
| 1946 | 773 | 3,492 | 3,479 | 13 | 28 | 4,192 | 18.4 | 59 |
| 1947 | 833 | 3,958 | 3,828 | 129 | 28 | 4,660 | 17.9 | 65 |
| 1948 | 876 | 4,396 | 4,127 | 268 | 28 | 5,137 | 17.1 | 70 |
| 1949 | 918 | 4,640 | 4,382 | 257 | 39 | 5,533 | 16.6 | 74 |
| 1950 | 1,013 | 4,863 | 4,690 | 173 | 44 | 5,863 | 17.3 | 77 |
| 1951 | 1,109 | 4,963 | 4,756 | 207 | 71 | 5,872 | 18.9 | 76 |
| 1952 | 1,109 | 5,033 | 4,850 | 183 | 105 | 5,915 | 18.7 | 75 |
| 1953 | 1,069 | 5,006 | 4,843 | 163 | 47 | 6,111 | 17.5 | 76 |
| 1954 | 1,202 | 4,995 | 4,867 | 128 | 140 | 6,106 | 19.7 | 75 |
| 1955 | 1,459 | 5,165 | 5,019 | 146 | 207 | 6,491 | 22.5 | 78 |
| 1956 | 1,620 | 5,569 | 5,258 | 311 | 152 | 6,807 | 23.8 | 81 |
| 1957 | 1,807 | 5,218 | 5,063 | 155 | 174 | 6,778 | 26.7 | 79 |
| 1958 | 1,726 | 4,883 | 4,774 | 109 | 127 | 6,515 | 26.5 | 75 |
| 1959 | 1,924 | 5,255 | 5,127 | 128 | 120 | 7,030 | 27.4 | 79 |
| 1960 | 2,004 | 5,450 | 5,289 | 161 | 135 | 7,353 | 27.3 | 81 |
| 1961 | 2,054 | 5,485 | 5,330 | 155 | 182 | 7,408 | 27.7 | 81 |
| 1962 | 2,105 | 5,487 | 5,301 | 186 | 110 | 7,464 | 28.2 | 80 |
| 1963 | 2,213 | 5,393 | 5,227 | 166 | 118 | 7,557 | 29.3 | 80 |
| 1964 | 2,296 | 5,954 | 5,693 | 262 | 118 | 8,093 | 28.4 | 84 |
| 1965 [5] | 2,197 | 6,323 | 6,083 | 239 | 84 | 8,358 | 26.3 | 86 |
| 1966 [5] | 2,398 | 6,991 | 6,716 | 275 | 99 | 9,149 | 26.2 | 93 |

[1] Data may not add to totals because of rounding.

[2] Imports from Canada and Europe for the years 1920–49 from the Newsprint Service Bureau. *World production and distribution of newsprint paper 1959–1960.* New York, 1962.

[3] Includes changes in stocks beginning in 1929.

[4] Includes Newfoundland.

[5] Preliminary.

Sources: See source note table 1 for all data except production in 1965 and 1966. These production estimates were based on data published by the American Newspaper Publishers Association. *Newsprint* Bull. Monthly.

TABLE 4.—*Groundwood paper production and consumption in the United States, 1920–66*

| Year | U.S. production | Apparent consumption | Per capita consumption |
|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 170 | 170 | 3 |
| 1921 | 92 | 92 | 2 |
| 1922 | 150 | 150 | 3 |
| 1923 | 166 | 166 | 3 |
| 1924 | 170 | 170 | 3 |
| 1925 | 189 | 189 | 3 |
| 1926 | 209 | 209 | 4 |
| 1927 | 296 | 296 | 5 |
| 1928 | 235 | 235 | 4 |
| 1929 | 363 | 363 | 6 |
| 1930 | 221 | 221 | 4 |
| 1931 | 311 | 311 | 5 |
| 1932 | 125 | 125 | 2 |
| 1933 | 285 | 285 | 5 |
| 1934 | 391 | 391 | 6 |
| 1935 | 384 | 384 | 6 |
| 1936 | 487 | 487 | 8 |
| 1937 | 596 | 596 | 9 |
| 1938 | 490 | 490 | 8 |
| 1939 | 568 | 568 | 9 |
| 1940 | 588 | 588 | 9 |
| 1941 | 643 | 643 | 10 |
| 1942 | 610 | 610 | 9 |
| 1943 | 586 | 586 | 9 |
| 1944 | 593 | 593 | 9 |
| 1945 | 636 | 636 | 9 |
| 1946 | 776 | 776 | 11 |
| 1947 | 821 | 821 | 11 |
| 1948 | 772 | 772 | 11 |
| 1949 | 675 | 675 | 9 |
| 1950 | 705 | 705 | 9 |
| 1951 | 790 | 790 | 10 |
| 1952 | 806 | 806 | 10 |
| 1953 | 771 | 771 | 10 |
| 1954 | 788 | 788 | 10 |
| 1955 | 886 | 886 | 11 |
| 1956 | 972 | 972 | 12 |
| 1957 | 846 | 846 | 10 |
| 1958 | 824 | 824 | 9 |
| 1959 | 909 | 909 | 10 |
| 1960 | 938 | 938 | 10 |
| 1961 | 907 | 907 | 10 |
| 1962 | 910 | 910 | 10 |
| 1963 | 956 | 956 | 10 |
| 1964 | 952 | 952 | 10 |
| 1965 [1] | 1,029 | 1,029 | 11 |
| 1966 [1] | 1,096 | 1,096 | 11 |

[1] Preliminary.

NOTE: Imports and exports of groundwood paper are included with imports and exports of book paper (table 5).

Sources: See source note table 1.

TABLE 5.—*Book paper production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | | | Imports [2] | | | Exports [2] | | | Apparent consumption | | | Per capita consumption | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Coated | Uncoated | Total | Coated | Uncoated | Total | Coated | Uncoated | Total | Coated | Uncoated | Total | Coated | Uncoated |
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* | *Pounds* | *Pounds* |
| 1920 | 955 | -- | -- | 2 | -- | 2 | 48 | -- | 48 | 910 | -- | -- | 17 | -- | -- |
| 1921 | 694 | -- | -- | 1 | -- | 1 | 20 | -- | 20 | 675 | -- | -- | 12 | -- | -- |
| 1922 | 838 | -- | -- | 3 | -- | 3 | 15 | -- | 15 | 826 | -- | -- | 15 | -- | -- |
| 1923 | 1,049 | -- | -- | 8 | -- | 8 | 13 | -- | 13 | 1,044 | -- | -- | 19 | -- | -- |
| 1924 | 1,050 | -- | -- | 13 | -- | 13 | 9 | -- | 9 | 1,054 | -- | -- | 19 | -- | -- |
| 1925 | 1,163 | -- | -- | 8 | -- | 8 | 9 | -- | 9 | 1,162 | -- | -- | 20 | -- | -- |
| 1926 | 1,193 | -- | -- | 8 | -- | 8 | 9 | -- | 9 | 1,192 | -- | -- | 20 | -- | -- |
| 1927 | 1,329 | -- | -- | 5 | -- | 5 | 8 | -- | 8 | 1,326 | -- | -- | 22 | -- | -- |
| 1928 | 1,334 | -- | -- | 4 | -- | 4 | 12 | -- | 12 | 1,326 | -- | -- | 22 | -- | -- |
| 1929 | 1,491 | -- | -- | 2 | -- | 2 | 19 | -- | 19 | 1,474 | -- | -- | 24 | -- | -- |
| 1930 | 1,383 | -- | -- | 1 | -- | 1 | 16 | -- | 16 | 1,368 | -- | -- | 22 | -- | -- |
| 1931 | 1,203 | -- | -- | 2 | -- | 2 | 10 | -- | 10 | 1,195 | -- | -- | 19 | -- | -- |
| 1932 | 941 | -- | -- | 2 | -- | 2 | 7 | -- | 7 | 935 | -- | -- | 15 | -- | -- |
| 1933 | 1,074 | -- | -- | 2 | -- | 2 | 9 | -- | 9 | 1,067 | -- | -- | 17 | -- | -- |
| 1934 | 1,050 | -- | -- | 4 | -- | 4 | 8 | -- | 8 | 1,046 | -- | -- | 17 | -- | -- |
| 1935 | 1,276 | -- | -- | 6 | -- | 6 | 10 | -- | 10 | 1,272 | -- | -- | 20 | -- | -- |
| 1936 | 1,427 | -- | -- | 11 | -- | 11 | 9 | -- | 9 | 1,429 | -- | -- | 22 | -- | -- |
| 1937 | 1,510 | -- | -- | 15 | -- | 15 | 15 | -- | 15 | 1,510 | -- | -- | 23 | -- | -- |
| 1938 | 1,296 | -- | -- | 10 | -- | 10 | 9 | -- | 9 | 1,297 | -- | -- | 20 | -- | -- |
| 1939 | 1,535 | -- | -- | 13 | -- | 13 | 15 | -- | 15 | 1,533 | -- | -- | 23 | -- | -- |
| 1940 | 1,655 | -- | -- | 17 | -- | 17 | 43 | -- | 43 | 1,629 | -- | -- | 25 | -- | -- |
| 1941 | 2,026 | -- | -- | 28 | -- | 28 | 41 | -- | 41 | 2,013 | -- | -- | 30 | -- | -- |
| 1942 | 1,716 | -- | -- | 28 | -- | 28 | 21 | -- | 21 | 1,723 | -- | -- | 26 | -- | -- |
| 1943 | 1,603 | -- | -- | 23 | -- | 23 | 22 | -- | 22 | 1,604 | -- | -- | 24 | -- | -- |
| 1944 | 1,443 | -- | -- | 27 | -- | 27 | 22 | -- | 22 | 1,448 | -- | -- | 21 | -- | -- |
| 1945 | 1,501 | 334 | 1,167 | 30 | -- | 30 | 49 | -- | 49 | 1,481 | 334 | 1,147 | 21 | 5 | 16 |
| 1946 | 1,933 | 486 | 1,447 | 80 | -- | 80 | 44 | — | 44 | 1,970 | 486 | 1,483 | 28 | 7 | 21 |
| 1947 | 2,208 | 627 | 1,581 | 74 | -- | 74 | 54 | — | 54 | 2,228 | 627 | 1,601 | 31 | 9 | 22 |
| 1948 | 2,379 | 809 | 1,570 | 83 | -- | 83 | 44 | — | 44 | 2,418 | 809 | 1,609 | 33 | 11 | 22 |
| 1949 | 2,301 | 887 | 1,413 | 28 | -- | 28 | 40 | 8 | 33 | 2,289 | 880 | 1,409 | 31 | 12 | 19 |
| 1950 | 2,600 | 1,020 | 1,580 | 35 | -- | 35 | 27 | 7 | 20 | 2,608 | 1,013 | 1,595 | 34 | 13 | 21 |
| 1951 | 2,723 | 1,113 | 1,610 | 47 | -- | 47 | 52 | 18 | 34 | 2,719 | 1,095 | 1,624 | 35 | 14 | 21 |
| 1952 | 2,579 | 1,096 | 1,482 | 43 | -- | 43 | 66 | 18 | 48 | 2,556 | 1,079 | 1,477 | 32 | 14 | 19 |
| 1953 | 2,785 | 1,182 | 1,603 | 41 | -- | 41 | 27 | 10 | 16 | 2,800 | 1,172 | 1,628 | 35 | 15 | 20 |
| 1954 | 2,799 | 1,222 | 1,577 | 36 | -- | 36 | 41 | 17 | 24 | 2,794 | 1,205 | 1,589 | 34 | 15 | 19 |
| 1955 | 3,052 | 1,312 | 1,740 | 43 | -- | 43 | 50 | 22 | 28 | 3,045 | 1,290 | 1,755 | 37 | 16 | 21 |
| 1956 | 3,332 | 1,512 | 1,820 | 60 | -- | 60 | 45 | 23 | 22 | 3,348 | 1,489 | 1,859 | 40 | 18 | 22 |
| 1957 | 3,187 | 1,537 | 1,650 | 40 | -- | 40 | 47 | 23 | 24 | 3,180 | 1,514 | 1,666 | 37 | 18 | 19 |
| 1958 | 3,213 | 1,559 | 1,654 | 41 | -- | 41 | 52 | 24 | 28 | 3,202 | 1,534 | 1,667 | 37 | 18 | 19 |
| 1959 | 3,600 | 1,706 | 1,894 | 45 | -- | 45 | 57 | 26 | 31 | 3,588 | 1,680 | 1,908 | 40 | 19 | 21 |
| 1960 | 3,763 | 1,875 | 1,887 | 46 | -- | 46 | 55 | 26 | 29 | 3,753 | 1,849 | 1,904 | 42 | 21 | 21 |
| 1961 | 3,794 | 2,140 | 1,654 | 42 | -- | 42 | 48 | 22 | 27 | 3,785 | 2,119 | 1,667 | 41 | 23 | 18 |
| 1962 | 4,028 | 2,269 | 1,760 | 49 | -- | 49 | 48 | 24 | 24 | 4,028 | 2,244 | 1,784 | 43 | 24 | 19 |
| 1963 | 4,288 | 2,401 | 1,886 | 54 | -- | 54 | 53 | 27 | 26 | 4,288 | 2,374 | 1,914 | 45 | 25 | 20 |
| 1964 | 4,610 | 2,620 | 1,990 | 83 | -- | 83 | 68 | 37 | 32 | 4,625 | 2,584 | 2,042 | 48 | 27 | 21 |
| 1965 [3] | 4,964 | 2,847 | 2,117 | 110 | -- | 110 | 67 | 54 | 13 | 5,006 | 2,793 | 2,214 | 51 | 29 | 23 |
| 1966 [3] | 5,392 | 3,039 | 2,353 | 150 | -- | 150 | 61 | 51 | 10 | 5,481 | 2,989 | 2,492 | 56 | 30 | 25 |

[1] Data may not add to totals because of rounding. [2] Includes groundwood paper. [3] Preliminary. Sources: See source note table 1.

TABLE 6.—*Fine paper production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 415 | -- | 27 | 387 | 7 |
| 1921 | 247 | -- | 13 | 234 | 4 |
| 1922 | 383 | 1 | 6 | 378 | 7 |
| 1923 | 398 | 9 | 5 | 402 | 7 |
| 1924 | 422 | 8 | 3 | 427 | 8 |
| 1925 | 498 | 8 | 3 | 503 | 9 |
| 1926 | 527 | 7 | 7 | 528 | 9 |
| 1927 | 535 | 11 | 8 | 537 | 9 |
| 1928 | 578 | 9 | 15 | 572 | 10 |
| 1929 | 737 | 10 | 16 | 731 | 12 |
| 1930 | 713 | 10 | 13 | 711 | 12 |
| 1931 | 593 | 13 | 9 | 597 | 10 |
| 1932 | 511 | 10 | 8 | 514 | 8 |
| 1933 | 571 | 9 | 8 | 573 | 9 |
| 1934 | 507 | 9 | 11 | 505 | 8 |
| 1935 | 614 | 9 | 14 | 609 | 10 |
| 1936 | 730 | 10 | 14 | 725 | 11 |
| 1937 | 700 | 10 | 20 | 690 | 11 |
| 1938 | 620 | 9 | 16 | 613 | 9 |
| 1939 | 723 | 10 | 21 | 712 | 11 |
| 1940 | 736 | 8 | 53 | 691 | 11 |
| 1941 | 950 | 3 | 46 | 906 | 14 |
| 1942 | 1,043 | 1 | 38 | 1,007 | 15 |
| 1943 | 1,011 | (2) | 58 | 953 | 14 |
| 1944 | 967 | (2) | 68 | 900 | 13 |
| 1945 | 1,001 | (2) | 86 | 916 | 13 |
| 1946 | 1,146 | 1 | 81 | 1,065 | 15 |
| 1947 | 1,172 | 2 | 68 | 1,105 | 15 |
| 1948 | 1,141 | 2 | 45 | 1,097 | 15 |
| 1949 | 1,012 | 1 | 44 | 969 | 13 |
| 1950 | 1,197 | 1 | 39 | 1,160 | 15 |
| 1951 | 1,366 | 1 | 48 | 1,320 | 17 |
| 1952 | 1,296 | 1 | 40 | 1,257 | 16 |
| 1953 | 1,299 | 3 | 34 | 1,268 | 16 |
| 1954 | 1,285 | 2 | 41 | 1,246 | 15 |
| 1955 | 1,450 | 2 | 42 | 1,410 | 17 |
| 1956 | 1,575 | 2 | 34 | 1,543 | 18 |
| 1957 | 1,516 | 4 | 39 | 1,481 | 17 |
| 1958 | 1,535 | 4 | 33 | 1,506 | 17 |
| 1959 | 1,759 | 6 | 32 | 1,733 | 20 |
| 1960 | 1,776 | 7 | 34 | 1,749 | 19 |
| 1961 | 1,924 | 6 | 34 | 1,896 | 21 |
| 1962 | 2,054 | 9 | 32 | 2,030 | 22 |
| 1963 | 2,104 | 7 | 30 | 2,080 | 22 |
| 1964 | 2,210 | 13 | 33 | 2,190 | 23 |
| 1965 [3] | 2,410 | 14 | 49 | 2,375 | 24 |
| 1966 [3] | 2,637 | 14 | 55 | 2,596 | 26 |

[1] Data may not add to total because of rounding.
[2] Less than 500 tons.
[3] Preliminary.
Sources: See source note table 1.

TABLE 7.—*Coarse and industrial paper*[1] *production, imports, exports, and consumption in the United States, 1920–66* [2]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 1,250 | 2 | 32 | 1,220 | 23 |
| 1921 | 920 | 6 | 14 | 912 | 17 |
| 1922 | 1,263 | 33 | 17 | 1,279 | 23 |
| 1923 | 1,348 | 44 | 14 | 1,378 | 25 |
| 1924 | 1,365 | 24 | 15 | 1,374 | 24 |
| 1925 | 1,439 | 10 | 17 | 1,432 | 25 |
| 1926 | 1,571 | 7 | 19 | 1,559 | 27 |
| 1927 | 1,610 | 12 | 19 | 1,603 | 27 |
| 1928 | 1,865 | 13 | 22 | 1,856 | 31 |
| 1929 | 1,736 | 9 | 25 | 1,719 | 28 |
| 1930 | 1,826 | 5 | 26 | 1,805 | 29 |
| 1931 | 1,510 | 3 | 18 | 1,495 | 24 |
| 1932 | 1,486 | 5 | 12 | 1,478 | 24 |
| 1933 | 1,594 | 5 | 15 | 1,584 | 25 |
| 1934 | 1,518 | 5 | 26 | 1,497 | 24 |
| 1935 | 1,727 | 14 | 24 | 1,717 | 27 |
| 1936 | 1,985 | 26 | 26 | 1,986 | 31 |
| 1937 | 2,191 | 19 | 29 | 2,181 | 34 |
| 1938 | 1,995 | 15 | 27 | 1,982 | 31 |
| 1939 | 2,397 | 15 | 33 | 2,379 | 36 |
| 1940 | 2,653 | 4 | 96 | 2,561 | 39 |
| 1941 | 2,869 | 5 | 82 | 2,792 | 42 |
| 1942 | 2,794 | 10 | 45 | 2,759 | 41 |
| 1943 | 2,558 | 1 | 46 | 2,513 | 37 |
| 1944 | 2,650 | 2 | 42 | 2,610 | 38 |
| 1945 | 2,730 | 1 | 51 | 2,680 | 38 |
| 1946 | 3,080 | 7 | 49 | 3,038 | 43 |
| 1947 | 3,293 | 23 | 46 | 3,270 | 45 |
| 1948 | 3,442 | 19 | 31 | 3,429 | 47 |
| 1949 | 3,099 | 6 | 39 | 3,065 | 41 |
| 1950 | 3,758 | 11 | 50 | 3,719 | 49 |
| 1951 | 4,163 | 11 | 89 | 4,086 | 53 |
| 1952 | 3,752 | 10 | 101 | 3,661 | 47 |
| 1953 | 3,939 | 35 | 67 | 3,907 | 49 |
| 1954 | 3,962 | 36 | 88 | 3,911 | 48 |
| 1955 | 4,297 | 43 | 97 | 4,243 | 51 |
| 1956 | 4,631 | 51 | 89 | 4,593 | 54 |
| 1957 | 4,314 | 43 | 104 | 4,253 | 50 |
| 1958 | 4,255 | 55 | 109 | 4,201 | 48 |
| 1959 | 4,751 | 83 | 92 | 4,742 | 53 |
| 1960 | 4,717 | 68 | 111 | 4,675 | 52 |
| 1961 | 4,841 | 67 | 115 | 4,793 | 52 |
| 1962 | 5,026 | 83 | 135 | 4,974 | 53 |
| 1963 | 5,162 | 75 | 157 | 5,080 | 54 |
| 1964 | 5,367 | 64 | 182 | 5,249 | 55 |
| 1965 [3] | 5,673 | 60 | 272 | 5,461 | 56 |
| 1966 [3] | 5,875 | 91 | 355 | 5,611 | 57 |

[1] Includes wrapping, shipping sack, bag, converting, special industrial, absorbent, and other similar grades of paper.
[2] Data may not add to total because of rounding.
[3] Preliminary.
Sources: See source note table 1.

TABLE 8.—*Sanitary and tissue paper production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 195 | -- | 5 | 190 | 4 |
| 1921 | 186 | -- | 2 | 184 | 3 |
| 1922 | 215 | -- | 1 | 214 | 4 |
| 1923 | 251 | -- | 2 | 249 | 4 |
| 1924 | 242 | -- | 1 | 241 | 4 |
| 1925 | 281 | -- | 2 | 279 | 5 |
| 1926 | 310 | -- | 2 | 308 | 5 |
| 1927 | 316 | -- | 2 | 314 | 5 |
| 1928 | 348 | -- | 2 | 346 | 6 |
| 1929 | 380 | -- | 2 | 378 | 6 |
| 1930 | 353 | -- | 2 | 351 | 6 |
| 1931 | 388 | -- | 1 | 387 | 6 |
| 1932 | 352 | -- | 2 | 350 | 6 |
| 1933 | 401 | -- | 2 | 399 | 6 |
| 1934 | 390 | (2) | 2 | 388 | 6 |
| 1935 | 466 | (2) | 2 | 463 | 7 |
| 1936 | 480 | (2) | 3 | 478 | 8 |
| 1937 | 526 | (2) | 5 | 521 | 8 |
| 1938 | 535 | (2) | 6 | 529 | 8 |
| 1939 | 648 | (2) | 6 | 642 | 10 |
| 1940 | 734 | (2) | 13 | 721 | 11 |
| 1941 | 913 | (2) | 14 | 899 | 14 |
| 1942 | 982 | (2) | 8 | 974 | 14 |
| 1943 | 969 | (2) | 12 | 957 | 14 |
| 1944 | 965 | (2) | 11 | 954 | 14 |
| 1945 | 981 | (2) | 10 | 971 | 14 |
| 1946 | 1,044 | (2) | 7 | 1,037 | 15 |
| 1947 | 1,089 | (2) | 8 | 1,080 | 15 |
| 1948 | 1,188 | (2) | 5 | 1,183 | 16 |
| 1949 | 1,195 | 1 | 10 | 1,186 | 16 |
| 1950 | 1,365 | (2) | 7 | 1,358 | 18 |
| 1951 | 1,473 | (2) | 7 | 1,466 | 19 |
| 1952 | 1,357 | (2) | 5 | 1,352 | 17 |
| 1953 | 1,505 | 1 | 6 | 1,500 | 19 |
| 1954 | 1,612 | 2 | 7 | 1,607 | 20 |
| 1955 | 1,761 | 1 | 7 | 1,755 | 21 |
| 1956 | 1,860 | 3 | 10 | 1,853 | 22 |
| 1957 | 1,912 | 2 | 12 | 1,902 | 22 |
| 1958 | 1,945 | 2 | 14 | 1,933 | 22 |
| 1959 | 2,128 | 2 | 14 | 2,116 | 24 |
| 1960 | 2,201 | 3 | 13 | 2,191 | 24 |
| 1961 | 2,312 | 3 | 10 | 2,305 | 25 |
| 1962 | 2,414 | 4 | 12 | 2,406 | 26 |
| 1963 | 2,576 | 6 | 16 | 2,566 | 27 |
| 1964 | 2,745 | (2) | 22 | 2,723 | 28 |
| 1965 [3] | 2,847 | (2) | 25 | 2,821 | 29 |
| 1966 [3] | 3,002 | (2) | 17 | 2,986 | 30 |

[1] Data may not add to total because of rounding.
[2] Less than 500 tons.
[3] Preliminary.
**Sources: See source note table 1.**

TABLE 9.—*Construction paper production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 375 | -- | -- | 375 | 7 |
| 1921 | 217 | -- | -- | 217 | 4 |
| 1922 | 422 | 1 | 3 | 419 | 8 |
| 1923 | 345 | 1 | 2 | 344 | 6 |
| 1924 | 350 | 1 | 4 | 348 | 6 |
| 1925 | 582 | 1 | 6 | 577 | 10 |
| 1926 | 650 | 1 | 6 | 645 | 11 |
| 1927 | 626 | 1 | 6 | 620 | 10 |
| 1928 | 566 | 1 | 7 | 560 | 9 |
| 1929 | 659 | 1 | 11 | 649 | 11 |
| 1930 | 469 | 1 | 9 | 460 | 8 |
| 1931 | 395 | 1 | 8 | 388 | 6 |
| 1932 | 294 | (2) | 3 | 290 | 5 |
| 1933 | 328 | (2) | 4 | 325 | 5 |
| 1934 | 328 | 1 | 4 | 325 | 5 |
| 1935 | 441 | 1 | 4 | 437 | 7 |
| 1936 | 550 | 1 | 4 | 546 | 9 |
| 1937 | 608 | 1 | 7 | 602 | 9 |
| 1938 | 570 | 1 | 8 | 564 | 9 |
| 1939 | 659 | 1 | 7 | 653 | 10 |
| 1940 | 682 | 1 | 6 | 677 | 10 |
| 1941 | 918 | 1 | 10 | 909 | 14 |
| 1942 | 1,001 | 1 | 7 | 995 | 15 |
| 1943 | 878 | 1 | 8 | 871 | 13 |
| 1944 | 881 | 1 | 6 | 876 | 13 |
| 1945 | 883 | 1 | 16 | 868 | 12 |
| 1946 | 1,022 | 1 | 9 | 1,014 | 14 |
| 1947 | 1,289 | 1 | 9 | 1,281 | 18 |
| 1948 | 1,321 | (2) | 8 | 1,314 | 18 |
| 1949 | 1,151 | (2) | 9 | 1,143 | 15 |
| 1950 | 1,425 | 2 | 8 | 1,419 | 19 |
| 1951 | 1,386 | 2 | 10 | 1,378 | 18 |
| 1952 | 1,299 | 2 | 8 | 1,293 | 16 |
| 1953 | 1,371 | 4 | 9 | 1,366 | 17 |
| 1954 | 1,428 | 2 | 10 | 1,420 | 17 |
| 1955 | 1,598 | 5 | 10 | 1,593 | 19 |
| 1956 | 1,428 | 2 | 10 | 1,420 | 17 |
| 1957 | 1,329 | 1 | 12 | 1,318 | 15 |
| 1958 | 1,389 | 1 | 11 | 1,379 | 16 |
| 1959 | 1,435 | 1 | 14 | 1,422 | 16 |
| 1960 | 1,410 | 1 | 14 | 1,397 | 16 |
| 1961 | 1,391 | 1 | 16 | 1,377 | 15 |
| 1962 | 1,429 | 1 | 11 | 1,419 | 15 |
| 1963 | 1,453 | 3 | 7 | 1,448 | 15 |
| 1964 | 1,534 | 3 | 9 | 1,527 | 16 |
| 1965 [3] | 1,554 | 2 | 1 | 1,555 | 16 |
| 1966 [3] | 1,516 | 1 | 1 | 1,516 | 15 |

[1] Data may not add to total because of rounding.
[2] Less than 500 tons.
[3] Preliminary.
Sources: See source note table 1.

TABLE 10.—*Board production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 2,313 | 43 | 61 | 2,296 | 43 |
| 1921 | 1,740 | 20 | 26 | 1,734 | 32 |
| 1922 | 2,156 | 34 | 28 | 2,162 | 39 |
| 1923 | 2,793 | 52 | 34 | 2,811 | 50 |
| 1924 | 2,850 | 54 | 41 | 2,863 | 50 |
| 1925 | 3,287 | 52 | 32 | 3,306 | 57 |
| 1926 | 3,650 | 55 | 55 | 3,651 | 62 |
| 1927 | 3,774 | 48 | 56 | 3,766 | 63 |
| 1928 | 4,062 | 37 | 65 | 4,034 | 67 |
| 1929 | 4,365 | 41 | 86 | 4,320 | 71 |
| 1930 | 3,979 | 29 | 84 | 3,924 | 64 |
| 1931 | 3,778 | 20 | 69 | 3,729 | 60 |
| 1932 | 3,243 | 17 | 44 | 3,216 | 52 |
| 1933 | 4,008 | 18 | 49 | 3,977 | 63 |
| 1934 | 4,014 | 20 | 52 | 3,982 | 63 |
| 1935 | 4,624 | 25 | 62 | 4,586 | 72 |
| 1936 | 5,378 | 33 | 66 | 5,344 | 83 |
| 1937 | 5,728 | 38 | 83 | 5,684 | 88 |
| 1938 | 5,041 | 26 | 85 | 4,982 | 77 |
| 1939 | 6,025 | 28 | 101 | 5,953 | 91 |
| 1940 | 6,379 | 21 | 236 | 6,163 | 93 |
| 1941 | 8,400 | 37 | 135 | 8,302 | 125 |
| 1942 | 7,969 | 75 | 103 | 7,941 | 118 |
| 1943 | 8,620 | 54 | 73 | 8,601 | 126 |
| 1944 | 8,963 | 52 | 73 | 8,941 | 129 |
| 1945 | 8,914 | 51 | 141 | 8,823 | 126 |
| 1946 | 9,504 | 42 | 88 | 9,459 | 134 |
| 1947 | 10,409 | 59 | 138 | 10,329 | 143 |
| 1948 | 10,779 | 75 | 134 | 10,720 | 186 |
| 1949 | 9,965 | 70 | 114 | 9,922 | 133 |
| 1950 | 12,312 | 85 | 122 | 12,275 | 161 |
| 1951 | 13,036 | 114 | 251 | 12,900 | 167 |
| 1952 | 12,221 | 84 | 174 | 12,131 | 154 |
| 1953 | 13,865 | 124 | 194 | 13,796 | 172 |
| 1954 | 13,799 | 109 | 264 | 13,644 | 167 |
| 1955 | 15,675 | 204 | 322 | 15,557 | 188 |
| 1956 | 16,203 | 157 | 329 | 15,851 | 188 |
| 1957 | 15,757 | 130 | 364 | 15,523 | 181 |
| 1958 | 15,937 | 133 | 382 | 15,688 | 179 |
| 1959 | 17,530 | 188 | 463 | 17,255 | 194 |
| 1960 | 17,635 | 141 | 536 | 17,240 | 191 |
| 1961 | 18,474 | 149 | 636 | 17,987 | 196 |
| 1962 | 19,577 | 189 | 652 | 19,114 | 205 |
| 1963 | 20,478 | 225 | 767 | 19,937 | 211 |
| 1964 | 22,034 | 233 | 1,064 | 21,203 | 221 |
| 1965 [2] | 23,174 | 262 | 1,141 | 22,295 | 229 |
| 1966 [2] | 24,825 | 248 | 1,211 | 23,862 | 243 |

[1] Data may not add to total because of rounding.
[2] Preliminary.
Sources: See source note table 1.

TABLE 11.—*Container board production, imports, exports, and consumption in the United States, 1925–66* [1]

| Year | U.S. production | Imports [2] | Exports [3] | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1925 | 1,777 | -- | -- | -- | -- |
| 1926 | -- | -- | -- | -- | -- |
| 1927 | 2,100 | -- | -- | -- | -- |
| 1928 | 1,985 | -- | -- | -- | -- |
| 1929 | 2,256 | -- | -- | -- | -- |
| 1930 | 1,916 | -- | -- | -- | -- |
| 1931 | 1,904 | -- | -- | -- | -- |
| 1932 | 1,593 | -- | -- | -- | -- |
| 1933 | 2,021 | -- | -- | -- | -- |
| 1934 | 1,882 | -- | -- | -- | -- |
| 1935 | 2,358 | -- | -- | -- | -- |
| 1936 | 2,756 | -- | -- | -- | -- |
| 1937 | 3,168 | 2 | 35 | 3,135 | 49 |
| 1938 | 2,631 | [4] | 42 | 2,590 | 40 |
| 1939 | 3,361 | [4] | 57 | 3,305 | 51 |
| 1940 | 3,435 | [4] | 152 | 3,283 | 50 |
| 1941 | 4,184 | [4] | 64 | 4,120 | 62 |
| 1942 | 3,755 | 39 | 59 | 3,735 | 55 |
| 1943 | 4,088 | 4 | 38 | 4,054 | 59 |
| 1944 | 4,228 | [4] | 43 | 4,186 | 61 |
| 1945 | 4,131 | -- | 74 | 4,057 | 58 |
| 1946 | 4,315 | [4] | 37 | 4,278 | 61 |
| 1947 | 4,944 | 2 | 60 | 4,886 | 68 |
| 1948 | 5,079 | 1 | 62 | 5,017 | 68 |
| 1949 | 4,680 | [4] | 55 | 4,625 | 62 |
| 1950 | 5,830 | [4] | 60 | 5,771 | 76 |
| 1951 | 6,323 | 3 | 135 | 6,191 | 80 |
| 1952 | 5,766 | 5 | 93 | 5,678 | 72 |
| 1953 | 6,653 | 34 | 110 | 6,576 | 82 |
| 1954 | 6,488 | 22 | 170 | 6,340 | 78 |
| 1955 | 7,551 | 18 | 213 | 7,356 | 89 |
| 1956 | 7,763 | 12 | 213 | 7,562 | 90 |
| 1957 | 7,631 | 18 | 255 | 7,394 | 86 |
| 1958 | 7,579 | 19 | 267 | 7,331 | 84 |
| 1959 | 8,441 | 17 | 350 | 8,108 | 91 |
| 1960 | 8,637 | 10 | 406 | 8,240 | 91 |
| 1961 | 9,251 | 10 | 468 | 8,794 | 96 |
| 1962 | 9,925 | 19 | 489 | 9,454 | 101 |
| 1963 | 10,425 | 21 | 599 | 9,846 | 104 |
| 1964 | 11,420 | 8 | 872 | 10,556 | 110 |
| 1965 [5] | 12,249 | 5 | 960 | 11,295 | 116 |
| 1966 [5] | 13,517 | 44 | 1,024 | 12,538 | 127 |

[1] Data may not add to total because of rounding.
[2] Includes small quantities of boxboard.
[3] Includes exports of boxboard (bending and nonbending) for the years 1937–49.
[4] Less than 500 tons.
[5] Preliminary.
Sources: See source note table 1.

TABLE 12.—*Bending board production and consumption in the United States, 1929–66* [1]

| Year | U.S. production | | | Apparent consumption | | | Per capita consumption | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Special food board | Folding boxboard [2] | Total | Special food board | Folding boxboard [2] | Total | Special food board | Folding boxboard [2] |
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* | *Pounds* | *Pounds* |
| 1929 | 991 | -- | -- | 991 | -- | -- | 16 | -- | -- |
| 1930 | 1,013 | -- | -- | 1,013 | -- | -- | 17 | -- | -- |
| 1931 | 906 | -- | -- | 906 | -- | -- | 15 | -- | -- |
| 1932 | 887 | -- | -- | 887 | -- | -- | 14 | -- | -- |
| 1933 | 958 | -- | -- | 958 | -- | -- | 15 | -- | -- |
| 1934 | 966 | -- | -- | 966 | -- | -- | 15 | -- | -- |
| 1935 | 1,121 | -- | -- | 1,121 | -- | -- | 18 | -- | -- |
| 1936 | 1,272 | -- | -- | 1,272 | -- | -- | 20 | -- | -- |
| 1937 | 1,289 | -- | -- | 1,289 | -- | -- | 20 | -- | -- |
| 1938 | 1,221 | -- | -- | 1,221 | -- | -- | 19 | -- | -- |
| 1939 | 1,360 | -- | -- | 1,360 | -- | -- | 21 | -- | -- |
| 1940 | 1,416 | -- | -- | 1,416 | -- | -- | 21 | -- | -- |
| 1941 | 1,842 | -- | -- | 1,842 | -- | -- | 28 | -- | -- |
| 1942 | 1,712 | 325 | 1,387 | 1,712 | 325 | 1,387 | 25 | 5 | 21 |
| 1943 | 2,047 | 385 | 1,662 | 2,047 | 385 | 1,662 | 30 | 6 | 24 |
| 1944 | 2,116 | 387 | 1,730 | 2,116 | 387 | 1,730 | 31 | 6 | 25 |
| 1945 | 2,270 | 374 | 1,896 | 2,270 | 374 | 1,896 | 32 | 5 | 27 |
| 1946 | 2,708 | 434 | 2,274 | 2,708 | 434 | 2,274 | 38 | 6 | 32 |
| 1947 | 2,758 | 460 | 2,298 | 2,758 | 460 | 2,298 | 38 | 6 | 32 |
| 1948 | 2,672 | 443 | 2,228 | 2,672 | 443 | 2,228 | 37 | 6 | 30 |
| 1949 | 2,613 | 516 | 2,097 | 2,613 | 516 | 2,097 | 35 | 7 | 28 |
| 1950 | 3,135 | 656 | 2,479 | 3,135 | 656 | 2,479 | 41 | 9 | 33 |
| 1951 | 3,272 | 773 | 2,499 | 3,272 | 773 | 2,499 | 42 | 10 | 32 |
| 1952 | 3,144 | 799 | 2,345 | 3,144 | 799 | 2,345 | 40 | 10 | 30 |
| 1953 | 3,544 | 954 | 2,590 | 3,544 | 954 | 2,590 | 44 | 12 | 32 |
| 1954 | 3,580 | 1,001 | 2,579 | 3,580 | 1,001 | 2,579 | 44 | 12 | 32 |
| 1955 | 3,929 | 1,154 | 2,775 | 3,929 | 1,154 | 2,775 | 47 | 14 | 34 |
| 1956 | 4,112 | 1,290 | 2,822 | 4,112 | 1,290 | 2,822 | 49 | 15 | 33 |
| 1957 | 4,149 | 1,281 | 2,868 | 4,149 | 1,281 | 2,868 | 48 | 15 | 33 |
| 1958 | 4,124 | 1,350 | 2,774 | 4,124 | 1,350 | 2,774 | 47 | 15 | 32 |
| 1959 | 4,352 | 1,447 | 2,904 | 4,352 | 1,447 | 2,904 | 49 | 16 | 33 |
| 1960 | 4,406 | 1,466 | 2,940 | 4,406 | 1,466 | 2,940 | 49 | 16 | 33 |
| 1961 | 4,474 | 1,596 | 2,878 | 4,474 | 1,596 | 2,878 | 49 | 17 | 31 |
| 1962 | 4,778 | 1,727 | 3,050 | 4,778 | 1,727 | 3,050 | 51 | 19 | 33 |
| 1963 | 4,902 | 1,737 | 3,165 | 4,902 | 1,737 | 3,165 | 52 | 18 | 33 |
| 1964 | 5,172 | 1,848 | 3,325 | 5,172 | 1,848 | 3,325 | 54 | 19 | 35 |
| 1965 [3] | 5,352 | 2,060 | 3,292 | 5,352 | 2,060 | 3,292 | 55 | 21 | 34 |
| 1966 [3] | 5,701 | 2,200 | 3,501 | 5,701 | 2,200 | 3,501 | 58 | 22 | 36 |

[1] Data may not add to totals because of rounding.
[2] Includes other bending board for the years 1942–57.
[3] Preliminary.
NOTE: Imports included in container board. Exports included in container board 1937–49, in other board 1950–66.
Source: See source note table 1.

TABLE 13.—*Building board production, imports, exports, and consumption in the United States, 1925–66* [1]

| Year | U.S production | | | Imports | | | Exports | | | Apparent consumption | | | Per capita consumption | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Insulating board | Hardboard | Total | Insulating board | Hardboard | Total | Insulating board | Hardboard | Total | Insulating board | Hardboard | Total | Insulating board | Hardboard |
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* | *Pounds* | *Pounds* |
| 1925 | 51 | -- | -- | 36 | -- | -- | 5 | -- | -- | 83 | -- | -- | 1 | -- | -- |
| 1926 | 70 | -- | -- | 35 | -- | -- | 4 | -- | -- | 102 | -- | -- | 2 | -- | -- |
| 1927 | 71 | -- | -- | 30 | -- | -- | 20 | -- | -- | 81 | -- | -- | 1 | -- | -- |
| 1928 | 81 | -- | -- | 26 | -- | -- | 27 | -- | -- | 80 | -- | -- | 1 | -- | -- |
| 1929 | 143 | -- | -- | 29 | -- | -- | 35 | -- | -- | 137 | -- | -- | 2 | -- | -- |
| 1930 | 124 | -- | -- | 21 | -- | -- | 37 | -- | -- | 108 | -- | -- | 2 | -- | -- |
| 1931 | 112 | -- | -- | 17 | -- | -- | 22 | -- | -- | 107 | -- | -- | 2 | -- | -- |
| 1932 | 62 | -- | -- | 16 | -- | -- | 13 | -- | -- | 65 | -- | -- | 1 | -- | -- |
| 1933 | 58 | -- | -- | 6 | -- | -- | 18 | -- | -- | 47 | -- | -- | 1 | -- | -- |
| 1934 | 68 | -- | -- | 9 | -- | -- | 18 | -- | -- | 59 | -- | -- | 1 | -- | -- |
| 1935 | 80 | -- | -- | 8 | -- | -- | 23 | -- | -- | 65 | -- | -- | 1 | -- | -- |
| 1936 | 98 | -- | -- | 17 | -- | -- | 27 | -- | -- | 88 | -- | -- | 1 | -- | -- |
| 1937 | 110 | -- | -- | 19 | -- | -- | 31 | 27 | 4 | 98 | -- | -- | 2 | -- | -- |
| 1938 | 118 | -- | -- | 15 | -- | -- | 24 | -- | -- | 109 | -- | -- | 2 | -- | -- |
| 1939 | 115 | -- | -- | 16 | 4 | 12 | 28 | 20 | 8 | 102 | -- | -- | 2 | -- | -- |
| 1940 | 179 | -- | -- | 10 | -- | -- | 27 | -- | -- | 163 | -- | -- | 2 | -- | -- |
| 1941 | 629 | -- | -- | 24 | 3 | 21 | 29 | 15 | 15 | 623 | -- | -- | 9 | -- | -- |
| 1942 | 877 | -- | -- | 25 | -- | -- | 19 | -- | -- | 882 | -- | -- | 13 | -- | -- |
| 1943 | 887 | -- | -- | 30 | 2 | 28 | 10 | 7 | 3 | 907 | -- | -- | 13 | -- | -- |
| 1944 | 918 | 637 | 281 | 30 | -- | -- | 13 | -- | -- | 936 | -- | -- | 14 | -- | -- |
| 1945 | 906 | 646 | 260 | 29 | 1 | 28 | 45 | 26 | 19 | 890 | 621 | 269 | 13 | 9 | 4 |
| 1946 | 976 | -- | -- | 28 | -- | -- | 27 | -- | -- | 977 | -- | -- | 14 | -- | -- |
| 1947 | 1,072 | 771 | 302 | 33 | 1 | 32 | 41 | 28 | 13 | 1,064 | 744 | 320 | 15 | 10 | 4 |
| 1948 | 1,270 | 906 | 365 | 31 | (2) | 30 | 36 | 18 | 18 | 1,266 | 888 | 377 | 17 | 12 | 5 |
| 1949 | 839 | 622 | 217 | 22 | (2) | 22 | 25 | 19 | 6 | 837 | 604 | 233 | 11 | 8 | 3 |
| 1950 | 1,221 | 838 | 383 | 31 | 3 | 27 | 23 | 16 | 8 | 1,228 | 826 | 402 | 16 | 11 | 5 |
| 1951 | 1,266 | 918 | 348 | 33 | 3 | 30 | 25 | 20 | 5 | 1,274 | 901 | 373 | 16 | 12 | 5 |
| 1952 | 1,309 | 899 | 410 | 27 | 4 | 23 | 25 | 17 | 8 | 1,311 | 886 | 425 | 17 | 11 | 5 |
| 1953 | 1,374 | 951 | 423 | 26 | 5 | 20 | 21 | 17 | 4 | 1,379 | 939 | 440 | 17 | 12 | 5 |
| 1954 | 1,473 | 1,008 | 465 | 45 | 4 | 42 | 23 | 18 | 5 | 1,495 | 993 | 502 | 18 | 12 | 6 |
| 1955 | 1,630 | 1,100 | 530 | 64 | 9 | 55 | 26 | 20 | 6 | 1,668 | 1,089 | 579 | 20 | 13 | 7 |
| 1956 | 1,642 | 1,102 | 540 | 86 | 11 | 76 | 29 | 22 | 7 | 1,699 | 1,091 | 609 | 20 | 13 | 7 |
| 1957 | 1,558 | 989 | 569 | 78 | 6 | 72 | 26 | 20 | 7 | 1,610 | 975 | 634 | 19 | 11 | 7 |
| 1958 | 1,666 | 1,057 | 609 | 79 | 9 | 70 | 20 | 14 | 6 | 1,725 | 1,052 | 673 | 20 | 12 | 8 |
| 1959 | 1,905 | 1,171 | 734 | 133 | 15 | 117 | 20 | 14 | 6 | 2,018 | 1,172 | 845 | 23 | 13 | 10 |
| 1960 | 1,784 | 1,098 | 686 | 106 | 12 | 94 | 20 | 14 | 6 | 1,869 | 1,096 | 774 | 21 | 12 | 9 |
| 1961 | 1,845 | 1,084 | 762 | 110 | 9 | 100 | 22 | 16 | 6 | 1,933 | 1,077 | 856 | 21 | 12 | 9 |
| 1962 | 1,945 | 1,080 | 865 | 143 | 15 | 128 | 22 | 16 | 6 | 2,066 | 1,079 | 987 | 22 | 12 | 11 |
| 1963 | 2,098 | 1,139 | 959 | 183 | 22 | 161 | 27 | 19 | 8 | 2,255 | 1,142 | 1,113 | 24 | 12 | 12 |
| 1964 | 2,263 | 1,215 | 1,048 | 214 | 23 | 190 | 30 | 19 | 11 | 2,446 | 1,219 | 1,227 | 25 | 13 | 13 |
| 1965 [3] | 2,279 | 1,269 | 1,010 | 244 | 23 | 221 | 29 | 16 | 13 | 2,494 | 1,276 | 1,218 | 26 | 13 | 13 |
| 1966 [3] | 2,201 | 1,147 | 1,053 | 192 | 24 | 168 | 35 | 18 | 17 | 2,358 | 1,153 | 1,205 | 24 | 12 | 12 |

[1] Data may not add to totals because of rounding.
[2] Less than 500 tons.
[3] Preliminary.
Sources: See source note table 1.

TABLE 14.—*Other board[1] production, imports, exports, and consumption in the United States, 1927–66* [2]

| Year | U.S. production | Imports [3] | Exports [4] | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1927 | 806 | -- | -- | -- | -- |
| 1928 | 1,049 | -- | -- | -- | -- |
| 1929 | 975 | -- | -- | -- | -- |
| 1930 | 928 | -- | -- | -- | -- |
| 1931 | 856 | -- | -- | -- | -- |
| 1932 | 701 | -- | -- | -- | -- |
| 1933 | 971 | -- | -- | -- | -- |
| 1934 | 1,097 | -- | -- | -- | -- |
| 1935 | 1,065 | -- | -- | -- | -- |
| 1936 | 1,251 | -- | -- | -- | -- |
| 1937 | 1,162 | 17 | 17 | 1,162 | 18 |
| 1938 | 1,070 | 11 | 20 | 1,062 | 16 |
| 1939 | 1,190 | 12 | 16 | 1,185 | 18 |
| 1940 | 1,348 | 10 | 57 | 1,302 | 20 |
| 1941 | 1,746 | 13 | 42 | 1,716 | 26 |
| 1942 | 1,625 | 12 | 25 | 1,612 | 24 |
| 1943 | 1,599 | 20 | 26 | 1,593 | 23 |
| 1944 | 1,700 | 21 | 17 | 1,704 | 25 |
| 1945 | 1,607 | 22 | 22 | 1,606 | 23 |
| 1946 | 1,506 | 14 | 24 | 1,495 | 21 |
| 1947 | 1,635 | 24 | 37 | 1,621 | 23 |
| 1948 | 1,758 | 44 | 36 | 1,766 | 24 |
| 1949 | 1,834 | 48 | 34 | 1,848 | 25 |
| 1950 | 2,125 | 54 | 39 | 2,141 | 28 |
| 1951 | 2,176 | 78 | 91 | 2,164 | 28 |
| 1952 | 2,001 | 52 | 56 | 1,998 | 25 |
| 1953 | 2,294 | 65 | 62 | 2,297 | 29 |
| 1954 | 2,259 | 41 | 71 | 2,229 | 27 |
| 1955 | 2,565 | 123 | 82 | 2,606 | 31 |
| 1956 | 2,506 | 58 | 87 | 2,477 | 29 |
| 1957 | 2,420 | 34 | 83 | 2,371 | 28 |
| 1958 | 2,568 | 35 | 95 | 2,508 | 29 |
| 1959 | 2,832 | 38 | 93 | 2,777 | 31 |
| 1960 | 2,808 | 25 | 109 | 2,725 | 30 |
| 1961 | 2,903 | 29 | 147 | 2,786 | 30 |
| 1962 | 2,930 | 27 | 141 | 2,816 | 30 |
| 1963 | 3,053 | 21 | 142 | 2,934 | 31 |
| 1964 | 3,178 | 12 | 162 | 3,029 | 32 |
| 1965 [5] | 3,293 | 13 | 153 | 3,154 | 32 |
| 1966 [5] | 3,406 | 11 | 153 | 3,264 | 33 |

[1] Includes nonbending, special paperboard, cardboard, wet machine board, and other similar grades of board.

[2] Data may not add to total because of rounding.

[3] Imports of nonbending board included in container board.

[4] Includes exports of bending board for the years 1950–66.

[5] Preliminary.

Sources: See source note table 1.

TABLE 15.—*Apparent consumption of paper and board in the United States, by grade, 1920–66* [1]

[Thousand tons]

| Year | Total paper and board | Paper | | | | | | | | Board | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total paper | Newsprint [2] | Groundwood paper | Book paper [3] | Fine paper | Coarse and industrial paper | Sanitary and tissue paper | Construction paper | Total board | Container board | Bending board [4] | Building board | Other board [5] |
| 1920 | 7,744 | 5,448 | 2,196 | 170 | 910 | 387 | 1,220 | 190 | 375 | 2,296 | -- | -- | -- | -- |
| 1921 | 6,061 | 4,327 | 2,013 | 92 | 675 | 234 | 912 | 184 | 217 | 1,734 | -- | -- | -- | -- |
| 1922 | 7,878 | 5,717 | 2,451 | 150 | 826 | 378 | 1,279 | 214 | 419 | 2,162 | -- | -- | -- | -- |
| 1923 | 9,208 | 6,397 | 2,814 | 166 | 1,044 | 402 | 1,378 | 249 | 344 | 2,811 | -- | -- | -- | -- |
| 1924 | 9,298 | 6,435 | 2,821 | 170 | 1,054 | 427 | 1,374 | 241 | 348 | 2,863 | -- | -- | -- | -- |
| 1925 | 10,437 | 7,131 | 2,989 | 189 | 1,162 | 503 | 1,432 | 279 | 577 | 3,306 | -- | -- | 83 | -- |
| 1926 | 11,607 | 7,956 | 3,516 | 209 | 1,192 | 528 | 1,559 | 308 | 645 | 3,651 | -- | -- | 102 | -- |
| 1927 | 11,954 | 8,188 | 3,492 | 296 | 1,326 | 537 | 1,603 | 314 | 620 | 3,766 | -- | -- | 81 | -- |
| 1928 | 12,489 | 8,455 | 3,561 | 235 | 1,326 | 572 | 1,856 | 346 | 560 | 4,034 | -- | -- | 80 | -- |
| 1929 | 13,421 | 9,101 | 3,787 | 363 | 1,474 | 731 | 1,719 | 378 | 649 | 4,320 | -- | 991 | 137 | -- |
| 1930 | 12,340 | 8,416 | 3,501 | 221 | 1,368 | 711 | 1,805 | 351 | 460 | 3,924 | -- | 1,013 | 108 | -- |
| 1931 | 11,400 | 7,671 | 3,298 | 311 | 1,195 | 597 | 1,495 | 387 | 388 | 3,729 | -- | 906 | 107 | -- |
| 1932 | 9,803 | 6,587 | 2,895 | 125 | 935 | 514 | 1,478 | 350 | 290 | 3,216 | -- | 887 | 65 | -- |
| 1933 | 10,869 | 6,893 | 2,660 | 285 | 1,067 | 573 | 1,584 | 399 | 325 | 3,977 | -- | 958 | 47 | -- |
| 1934 | 11,201 | 7,219 | 3,068 | 391 | 1,046 | 505 | 1,497 | 388 | 325 | 3,982 | -- | 966 | 59 | -- |
| 1935 | 12,820 | 8,234 | 3,351 | 384 | 1,272 | 609 | 1,717 | 463 | 437 | 4,586 | -- | 1,121 | 65 | -- |
| 1936 | 14,652 | 9,308 | 3,657 | 487 | 1,429 | 725 | 1,986 | 478 | 546 | 5,344 | -- | 1,272 | 88 | -- |
| 1937 | 15,653 | 9,969 | 3,868 | 596 | 1,510 | 690 | 2,181 | 521 | 602 | 5,684 | 3,135 | 1,289 | 98 | 1,162 |
| 1938 | 13,951 | 8,970 | 3,492 | 490 | 1,297 | 613 | 1,982 | 529 | 564 | 4,982 | 2,590 | 1,221 | 109 | 1,062 |
| 1939 | 15,982 | 10,029 | 3,543 | 568 | 1,533 | 712 | 2,379 | 642 | 653 | 5,953 | 3,305 | 1,360 | 102 | 1,185 |
| 1940 | 16,770 | 10,606 | 3,739 | 588 | 1,629 | 691 | 2,561 | 721 | 677 | 6,163 | 3,283 | 1,416 | 163 | 1,302 |
| 1941 | 20,386 | 12,084 | 3,923 | 643 | 2,013 | 906 | 2,792 | 899 | 909 | 8,302 | 4,120 | 1,842 | 623 | 1,716 |
| 1942 | 19,731 | 11,790 | 3,722 | 610 | 1,723 | 1,007 | 2,759 | 974 | 995 | 7,941 | 3,735 | 1,712 | 882 | 1,612 |
| 1943 | 19,644 | 11,043 | 3,559 | 586 | 1,604 | 953 | 2,513 | 957 | 871 | 8,601 | 4,054 | 2,047 | 907 | 1,593 |
| 1944 | 19,540 | 10,599 | 3,218 | 593 | 1,448 | 900 | 2,610 | 954 | 876 | 8,941 | 4,186 | 2,116 | 936 | 1,704 |
| 1945 | 19,827 | 11,004 | 3,452 | 636 | 1,481 | 916 | 2,680 | 971 | 868 | 8,823 | 4,057 | 2,270 | 890 | 1,606 |
| 1946 | 22,550 | 13,091 | 4,192 | 776 | 1,970 | 1,065 | 3,038 | 1,037 | 1,014 | 9,459 | 4,278 | 2,708 | 977 | 1,495 |
| 1947 | 24,775 | 14,445 | 4,660 | 821 | 2,228 | 1,105 | 3,270 | 1,080 | 1,281 | 10,329 | 4,886 | 2,758 | 1,064 | 1,621 |
| 1948 | 26,070 | 15,350 | 5,137 | 772 | 2,418 | 1,097 | 3,429 | 1,183 | 1,314 | 10,720 | 5,017 | 2,672 | 1,266 | 1,766 |
| 1949 | 24,781 | 14,859 | 5,533 | 675 | 2,289 | 969 | 3,065 | 1,186 | 1,143 | 9,922 | 4,625 | 2,613 | 837 | 1,848 |
| 1950 | 29,108 | 16,833 | 5,863 | 705 | 2,608 | 1,160 | 3,719 | 1,358 | 1,419 | 12,275 | 5,771 | 3,135 | 1,228 | 2,141 |
| 1951 | 30,530 | 17,630 | 5,872 | 790 | 2,719 | 1,320 | 4,086 | 1,466 | 1,378 | 12,900 | 6,191 | 3,272 | 1,274 | 2,164 |
| 1952 | 28,971 | 16,839 | 5,915 | 806 | 2,556 | 1,257 | 3,661 | 1,352 | 1,293 | 12,131 | 5,678 | 3,144 | 1,311 | 1,998 |
| 1953 | 31,520 | 17,724 | 6,111 | 771 | 2,800 | 1,268 | 3,907 | 1,500 | 1,366 | 13,796 | 6,576 | 3,544 | 1,379 | 2,297 |
| 1954 | 31,516 | 17,873 | 6,106 | 788 | 2,794 | 1,246 | 3,911 | 1,607 | 1,420 | 13,644 | 6,340 | 3,580 | 1,495 | 2,229 |
| 1955 | 34,979 | 19,422 | 6,491 | 886 | 3,045 | 1,410 | 4,243 | 1,755 | 1,593 | 15,557 | 7,356 | 3,929 | 1,668 | 2,606 |
| 1956 | 36,386 | 20,537 | 6,807 | 972 | 3,348 | 1,543 | 4,593 | 1,853 | 1,420 | 15,851 | 7,562 | 4,112 | 1,699 | 2,477 |
| 1957 | 35,280 | 19,757 | 6,778 | 846 | 3,180 | 1,481 | 4,253 | 1,902 | 1,318 | 15,523 | 7,394 | 4,149 | 1,610 | 2,371 |
| 1958 | 35,248 | 19,560 | 6,515 | 824 | 3,202 | 1,506 | 4,201 | 1,933 | 1,379 | 15,688 | 7,331 | 4,124 | 1,725 | 2,508 |
| 1959 | 38,793 | 21,540 | 7,030 | 909 | 3,588 | 1,733 | 4,742 | 2,116 | 1,422 | 17,255 | 8,108 | 4,352 | 2,018 | 2,777 |
| 1960 | 39,295 | 22,055 | 7,353 | 938 | 3,753 | 1,749 | 4,675 | 2,191 | 1,397 | 17,240 | 8,240 | 4,406 | 1,869 | 2,725 |
| 1961 | 40,461 | 22,474 | 7,408 | 907 | 3,785 | 1,896 | 4,793 | 2,305 | 1,377 | 17,987 | 8,794 | 4,474 | 1,933 | 2,786 |
| 1962 | 42,345 | 23,231 | 7,464 | 910 | 4,028 | 2,030 | 4,974 | 2,406 | 1,419 | 19,114 | 9,454 | 4,778 | 2,066 | 2,816 |
| 1963 | 43,913 | 23,976 | 7,557 | 956 | 4,288 | 2,080 | 5,080 | 2,566 | 1,448 | 19,937 | 9,846 | 4,902 | 2,255 | 2,934 |
| 1964 | 46,562 | 25,359 | 8,093 | 952 | 4,625 | 2,190 | 5,249 | 2,723 | 1,527 | 21,203 | 10,556 | 5,172 | 2,446 | 3,029 |
| 1965 [6] | 48,900 | 26,605 | 8,358 | 1,029 | 5,006 | 2,375 | 5,461 | 2,821 | 1,555 | 22,295 | 11,295 | 5,352 | 2,494 | 3,154 |
| 1966 [6] | 52,298 | 28,435 | 9,149 | 1,096 | 5,481 | 2,596 | 5,611 | 2,986 | 1,516 | 23,862 | 12,538 | 5,701 | 2,358 | 3,264 |

[1] Data may not add to totals because of rounding. [2] Includes changes in stock beginning in 1929. [3] Includes machine-coated paper. [4] Includes special food board. [5] Includes nonbending, special paperboard, cardboard, wet machine board, and other similar grades of board. [6] Preliminary. Sources: See source note table 1.

TABLE 16.—*Apparent per capita consumption of paper and board in the United States, by grade, 1920–66* [1]

[Pounds]

| Year | Total paper and board | Paper | | | | | | | | Board | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total paper | Newsprint [2] | Groundwood paper | Book paper [3] | Fine paper | Coarse and industrial paper | Sanitary and tissue paper | Construction paper | Total board | Container board | Bending board [4] | Building board | Other board [5] |
| 1920 | 145 | 102 | 41 | 3 | 17 | 7 | 23 | 4 | 7 | 43 | -- | -- | -- | -- |
| 1921 | 112 | 80 | 37 | 2 | 12 | 4 | 17 | 3 | 4 | 32 | -- | -- | -- | -- |
| 1922 | 143 | 104 | 45 | 3 | 15 | 7 | 23 | 4 | 8 | 39 | -- | -- | -- | -- |
| 1923 | 164 | 114 | 50 | 3 | 19 | 7 | 25 | 4 | 6 | 50 | -- | -- | -- | -- |
| 1924 | 163 | 113 | 49 | 3 | 19 | 8 | 24 | 4 | 6 | 50 | -- | -- | -- | -- |
| 1925 | 180 | 123 | 52 | 3 | 20 | 9 | 25 | 5 | 10 | 57 | -- | -- | 1 | -- |
| 1926 | 198 | 136 | 60 | 4 | 20 | 9 | 27 | 5 | 11 | 62 | -- | -- | 2 | -- |
| 1927 | 201 | 138 | 59 | 5 | 22 | 9 | 27 | 5 | 10 | 63 | -- | -- | 1 | -- |
| 1928 | 207 | 140 | 59 | 4 | 22 | 10 | 31 | 6 | 9 | 67 | -- | -- | 1 | -- |
| 1929 | 220 | 149 | 62 | 6 | 24 | 12 | 28 | 6 | 11 | 71 | -- | 16 | 2 | -- |
| 1930 | 201 | 137 | 57 | 4 | 22 | 12 | 29 | 6 | 8 | 64 | -- | 17 | 2 | -- |
| 1931 | 184 | 124 | 53 | 5 | 19 | 10 | 24 | 6 | 6 | 60 | -- | 15 | 2 | -- |
| 1932 | 157 | 106 | 46 | 2 | 15 | 8 | 24 | 6 | 5 | 52 | -- | 14 | 1 | -- |
| 1933 | 173 | 110 | 42 | 5 | 17 | 9 | 25 | 6 | 5 | 63 | -- | 15 | 1 | -- |
| 1934 | 177 | 114 | 49 | 6 | 17 | 8 | 24 | 6 | 5 | 63 | -- | 15 | 1 | -- |
| 1935 | 201 | 129 | 53 | 6 | 20 | 10 | 27 | 7 | 7 | 72 | -- | 18 | 1 | -- |
| 1936 | 229 | 145 | 57 | 8 | 22 | 11 | 31 | 8 | 9 | 83 | -- | 20 | 1 | -- |
| 1937 | 243 | 155 | 60 | 9 | 23 | 11 | 34 | 8 | 9 | 88 | 49 | 20 | 2 | 18 |
| 1938 | 215 | 138 | 54 | 8 | 20 | 9 | 31 | 8 | 9 | 77 | 40 | 19 | 2 | 16 |
| 1939 | 244 | 153 | 54 | 9 | 23 | 11 | 36 | 10 | 10 | 91 | 51 | 21 | 2 | 18 |
| 1940 | 254 | 161 | 57 | 9 | 25 | 11 | 39 | 11 | 10 | 93 | 50 | 21 | 2 | 20 |
| 1941 | 306 | 181 | 59 | 10 | 30 | 14 | 42 | 14 | 14 | 125 | 62 | 28 | 9 | 26 |
| 1942 | 293 | 175 | 55 | 9 | 26 | 15 | 41 | 14 | 15 | 118 | 55 | 25 | 13 | 24 |
| 1943 | 287 | 162 | 52 | 9 | 24 | 14 | 37 | 14 | 13 | 126 | 59 | 30 | 13 | 23 |
| 1944 | 282 | 153 | 47 | 9 | 21 | 13 | 38 | 14 | 13 | 129 | 61 | 31 | 14 | 25 |
| 1945 | 283 | 157 | 49 | 9 | 21 | 13 | 38 | 14 | 12 | 126 | 58 | 32 | 13 | 23 |
| 1946 | 319 | 185 | 59 | 11 | 28 | 15 | 43 | 15 | 14 | 134 | 61 | 38 | 14 | 21 |
| 1947 | 344 | 200 | 65 | 11 | 31 | 15 | 45 | 15 | 18 | 143 | 68 | 38 | 15 | 23 |
| 1948 | 356 | 209 | 70 | 11 | 33 | 15 | 47 | 16 | 18 | 186 | 68 | 37 | 17 | 24 |
| 1949 | 332 | 199 | 74 | 9 | 31 | 13 | 41 | 16 | 15 | 133 | 62 | 35 | 11 | 25 |
| 1950 | 382 | 221 | 77 | 9 | 34 | 15 | 49 | 18 | 19 | 161 | 76 | 41 | 16 | 28 |
| 1951 | 394 | 228 | 76 | 10 | 35 | 17 | 53 | 19 | 18 | 167 | 80 | 42 | 16 | 28 |
| 1952 | 368 | 214 | 75 | 10 | 32 | 16 | 47 | 17 | 16 | 154 | 72 | 40 | 17 | 25 |
| 1953 | 394 | 221 | 76 | 10 | 35 | 16 | 49 | 19 | 17 | 172 | 82 | 44 | 17 | 29 |
| 1954 | 387 | 219 | 75 | 10 | 34 | 15 | 48 | 20 | 17 | 167 | 78 | 44 | 18 | 27 |
| 1955 | 422 | 234 | 78 | 11 | 37 | 17 | 51 | 21 | 19 | 188 | 89 | 47 | 20 | 31 |
| 1956 | 431 | 243 | 81 | 12 | 40 | 18 | 54 | 22 | 17 | 188 | 90 | 49 | 20 | 29 |
| 1957 | 410 | 230 | 79 | 10 | 37 | 17 | 50 | 22 | 15 | 181 | 86 | 48 | 19 | 28 |
| 1958 | 403 | 224 | 75 | 9 | 37 | 17 | 48 | 22 | 16 | 179 | 84 | 47 | 20 | 29 |
| 1959 | 436 | 242 | 79 | 10 | 40 | 20 | 53 | 24 | 16 | 194 | 91 | 49 | 23 | 31 |
| 1960 | 435 | 244 | 81 | 10 | 42 | 19 | 52 | 24 | 16 | 191 | 91 | 49 | 21 | 30 |
| 1961 | 440 | 245 | 81 | 10 | 41 | 21 | 52 | 25 | 15 | 196 | 96 | 49 | 21 | 30 |
| 1962 | 454 | 249 | 80 | 10 | 43 | 22 | 53 | 26 | 15 | 205 | 101 | 51 | 22 | 30 |
| 1963 | 464 | 253 | 80 | 10 | 45 | 22 | 54 | 27 | 15 | 211 | 104 | 52 | 24 | 31 |
| 1964 | 485 | 264 | 84 | 10 | 48 | 23 | 55 | 28 | 16 | 221 | 110 | 54 | 25 | 32 |
| 1965 [6] | 503 | 273 | 86 | 11 | 51 | 24 | 56 | 29 | 16 | 229 | 116 | 55 | 26 | 32 |
| 1966 [6] | 531 | 289 | 93 | 11 | 56 | 26 | 57 | 30 | 15 | 243 | 127 | 58 | 24 | 33 |

[1] Data may not add to totals because of rounding. [2] Includes changes in stock beginning in 1929. [3] Includes machine-coated paper. [4] Includes special food board. [5] Includes nonbending, special paperboard, cardboard, wet machine board, and other similar grades of board. [6] Preliminary. Sources: Derived from data published by the American Paper Institute and the U.S. Department of Commerce, see source note table 1.

TABLE 17.—*Imports of paper and board into the United States, by grade, 1920–66* [1]

[Thousand tons]

| Year | Total paper and board | Paper | | | | | | Board | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total paper | Newsprint | Book paper [2] | Fine paper | Coarse and industrial paper | Other paper | Total board | Container board [3] | Building board | Other board |
| 1920 | 778 | 735 | 730 | 2 | -- | 2 | -- | 43 | -- | -- | -- |
| 1921 | 819 | 799 | 793 | 1 | -- | 6 | -- | 20 | -- | -- | -- |
| 1922 | 1,099 | 1,066 | 1,029 | 3 | 1 | 33 | 1 | 34 | -- | -- | -- |
| 1923 | 1,423 | 1,372 | 1,309 | 8 | 9 | 44 | 1 | 52 | -- | -- | -- |
| 1924 | 1,459 | 1,404 | 1,357 | 13 | 8 | 24 | 1 | 54 | -- | -- | -- |
| 1925 | 1,528 | 1,476 | 1,448 | 8 | 8 | 10 | 1 | 52 | -- | 36 | -- |
| 1926 | 1,930 | 1,875 | 1,851 | 8 | 7 | 7 | 1 | 55 | -- | 35 | -- |
| 1927 | 2,065 | 2,016 | 1,987 | 5 | 11 | 12 | 1 | 48 | -- | 30 | -- |
| 1928 | 2,222 | 2,184 | 2,157 | 4 | 9 | 13 | 1 | 37 | -- | 26 | -- |
| 1929 | 2,485 | 2,445 | 2,423 | 2 | 10 | 9 | 1 | 41 | -- | 29 | -- |
| 1930 | 2,326 | 2,297 | 2,280 | 1 | 10 | 5 | 1 | 29 | -- | 21 | -- |
| 1931 | 2,105 | 2,085 | 2,067 | 2 | 13 | 3 | 1 | 20 | -- | 17 | -- |
| 1932 | 1,827 | 1,809 | 1,792 | 2 | 10 | 5 | [4] | 17 | -- | 16 | -- |
| 1933 | 1,828 | 1,810 | 1,794 | 2 | 9 | 5 | [4] | 18 | -- | 6 | -- |
| 1934 | 2,250 | 2,229 | 2,210 | 4 | 9 | 5 | 1 | 20 | -- | 9 | -- |
| 1935 | 2,438 | 2,413 | 2,383 | 6 | 9 | 14 | 1 | 25 | -- | 8 | -- |
| 1936 | 2,832 | 2,799 | 2,752 | 11 | 10 | 26 | 1 | 33 | -- | 17 | -- |
| 1937 | 3,401 | 3,363 | 3,317 | 15 | 10 | 19 | 1 | 38 | 2 | 19 | 17 |
| 1938 | 2,336 | 2,309 | 2,275 | 10 | 9 | 15 | 1 | 26 | [4] | 15 | 11 |
| 1939 | 2,683 | 2,654 | 2,615 | 13 | 10 | 15 | 1 | 28 | [4] | 16 | 12 |
| 1940 | 2,812 | 2,791 | 2,763 | 17 | 8 | 4 | 1 | 21 | [4] | 10 | 10 |
| 1941 | 3,056 | 3,019 | 2,982 | 28 | 3 | 5 | 1 | 37 | [4] | 24 | 13 |
| 1942 | 3,036 | 2,961 | 2,921 | 28 | 1 | 10 | 1 | 75 | 39 | 25 | 12 |
| 1943 | 2,717 | 2,663 | 2,637 | 23 | [4] | 1 | 1 | 54 | 4 | 30 | 20 |
| 1944 | 2,574 | 2,522 | 2,491 | 27 | [4] | 2 | 1 | 52 | [4] | 30 | 21 |
| 1945 | 2,751 | 2,700 | 2,669 | 30 | [4] | 1 | 1 | 51 | -- | 29 | 22 |
| 1946 | 3,622 | 3,580 | 3,492 | 80 | 1 | 7 | 1 | 42 | [4] | 28 | 14 |
| 1947 | 4,116 | 4,057 | 3,958 | 74 | 2 | 23 | 1 | 59 | 2 | 33 | 24 |
| 1948 | 4,575 | 4,500 | 4,396 | 83 | 2 | 19 | 1 | 75 | 1 | 31 | 44 |
| 1949 | 4,746 | 4,676 | 4,640 | 28 | 1 | 6 | 2 | 70 | [4] | 22 | 48 |
| 1950 | 4,998 | 4,913 | 4,863 | 35 | 1 | 11 | 3 | 85 | [4] | 31 | 54 |
| 1951 | 5,139 | 5,025 | 4,963 | 47 | 1 | 11 | 2 | 114 | 3 | 33 | 78 |
| 1952 | 5,173 | 5,090 | 5,033 | 43 | 1 | 10 | 2 | 84 | 5 | 27 | 52 |
| 1953 | 5,215 | 5,091 | 5,006 | 41 | 3 | 35 | 4 | 124 | 34 | 26 | 65 |
| 1954 | 5,182 | 5,073 | 4,995 | 36 | 2 | 36 | 4 | 109 | 22 | 45 | 41 |
| 1955 | 5,463 | 5,259 | 5,165 | 43 | 2 | 43 | 6 | 204 | 18 | 64 | 123 |
| 1956 | 5,844 | 5,688 | 5,569 | 60 | 2 | 51 | 5 | 157 | 12 | 86 | 58 |
| 1957 | 5,438 | 5,308 | 5,218 | 40 | 4 | 43 | 3 | 130 | 18 | 78 | 34 |
| 1958 | 5,120 | 4,986 | 4,883 | 41 | 4 | 55 | 3 | 133 | 19 | 79 | 35 |
| 1959 | 5,579 | 5,392 | 5,255 | 45 | 6 | 83 | 3 | 188 | 17 | 133 | 38 |
| 1960 | 5,715 | 5,574 | 5,450 | 46 | 7 | 68 | 4 | 141 | 10 | 106 | 25 |
| 1961 | 5,754 | 5,605 | 5,485 | 42 | 6 | 67 | 4 | 149 | 10 | 110 | 29 |
| 1962 | 5,821 | 5,632 | 5,487 | 49 | 9 | 83 | 5 | 189 | 19 | 143 | 27 |
| 1963 | 5,762 | 5,537 | 5,393 | 54 | 7 | 75 | 9 | 225 | 21 | 183 | 21 |
| 1964 | 6,351 | 6,117 | 5,954 | 83 | 13 | 64 | 3 | 233 | 8 | 214 | 12 |
| 1965 [5] | 6,770 | 6,508 | 6,323 | 110 | 14 | 60 | 2 | 262 | 5 | 244 | 13 |
| 1966 [5] | 7,495 | 7,247 | 6,991 | 150 | 14 | 91 | 1 | 248 | 44 | 192 | 11 |

[1] Data may not add to totals because of rounding.
[2] Includes groundwood paper.
[3] Includes small quantities of boxboard.
[4] Less than 500 tons.
[5] Preliminary.
Sources: See source note table 1.

TABLE 18.—*Imports of paper and board into the United States, by grade and major region of origin, 1964* [1]

[Thousand tons]

| Region | Total paper and board | Paper | | | | | | Board | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Newsprint | Book paper | Fine paper | Coarse and industrial paper | Other paper | Total | Container board | Building board | Other board |
| Canada | 5,843 | 5,783 | 5,693 | 76 | (2) | 10 | 3 | 60 | -- | 54 | 6 |
| Latin America | 5 | (2) | (2) | -- | -- | -- | -- | 6 | -- | 5 | -- |
| Western Europe | 494 | 334 | 260 | 7 | 13 | 54 | (2) | 160 | 8 | 146 | 6 |
| Eastern Europe | 3 | (2) | (2) | -- | -- | (2) | -- | 3 | -- | 3 | -- |
| Africa | 6 | (2) | -- | -- | (2) | -- | -- | 6 | -- | 6 | -- |
| Near and Middle East | 1 | -- | -- | -- | -- | -- | -- | 1 | -- | 1 | -- |
| Far East | 1 | (2) | (2) | (2) | (2) | (2) | (2) | 1 | -- | 1 | (2) |
| Oceania | 2 | (2) | (2) | -- | -- | (2) | -- | 2 | -- | 2 | -- |
| Total | 6,351 | 6,117 | 5,954 | 83 | 13 | 64 | 3 | 239 | 8 | 219 | 12 |

[1] Data may not add to totals because of rounding.

[2] Less than 500 tons.

NOTE: Regions are as follows: *Latin America:* Argentina, Bahamas, Bermuda, Bolivia, Brazil, British Guiana, British Honduras, British West Indies, Canal Zone, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Falkland Islands, French Guiana, French West Indies, Guatemala, Haiti, Honduras, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Surinam, Trinidad and Tobago, Uruguay, Venezuela. *Western Europe:* Austria, Azores, Belgium, Cyprus, Denmark, Finland, France, Gibraltar, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, West Germany. *Eastern Europe:* Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R., Yugoslavia. *Africa:* Algeria, Angola and Cabinda, Basutoland, Bechuanaland, Burundi, Cameroon, Canary Islands, Central African Republic, Chad, Congo (Brazzaville), Congo (Leopoldville), Dahomey, Ethiopia, French Somaliland, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Libya, Madeira Islands, Malagasy Republic, Malawi, Mauritius and Dependencies, Morocco, Mozambique, Niger, Nigeria, Portuguese Guinea, Republic of South Africa, Rhodesia, Rwanda, Senegal, Seychelles and Dependencies, Sierra Leone, Somali Republic, Spanish Africa, Sudan, Swaziland, Tanganyika and Zanzibar, Togo, Tunisia, Uganda, United Arab Republic, Upper Volta, Zambia. *Near and Middle East:* Bahrain, Federation of South Arabia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Saudi Arabia, Syrian Arab Republic, Turkey, Yemen. *Far East:* Afghanistan, Brunei, Burma, Cambodia, Ceylon, China Mainland, Hong Kong, India, Indonesia, Japan, Laos, Macao and Timor, Malaysia, Nepal, North Korea, North Vietnam, Outer Mongolia, Pakistan, Philippines, Republic of Korea, Republic of Vietnam, Taiwan, Thailand. *Oceania:* Australia, Fiji, New Zealand. Country designations based on information published by the U.S. Department of Commerce, Bureau of the Census in *Schedule C.—Classification of country designations used in compiling the United States foreign trade statistics.* January 1, 1965 ed.

Source: U.S. Department of Commerce, Bureau of the Census. *U.S. imports of merchandise for consumption.* FT 125. 1964. Annual.

TABLE 19.—*Exports of paper and board from the United States, by grade, 1920–66* [1]
[Thousand tons]

| Year | Total paper and board | Paper | | | | | | Board | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total paper | Newsprint | Book paper [2] | Fine paper | Coarse and industrial paper | Other paper | Total board | Container board [3] | Building board | Other board |
| 1920 | 219 | 158 | 46 | 48 | 27 | 32 | 5 | 61 | -- | -- | -- |
| 1921 | 91 | 66 | 17 | 20 | 13 | 14 | 2 | 26 | -- | -- | -- |
| 1922 | 96 | 67 | 26 | 15 | 6 | 17 | 5 | 28 | -- | -- | -- |
| 1923 | 86 | 52 | 16 | 13 | 5 | 14 | 4 | 34 | -- | -- | -- |
| 1924 | 91 | 50 | 17 | 9 | 3 | 15 | 5 | 41 | -- | -- | -- |
| 1925 | 92 | 60 | 23 | 9 | 3 | 17 | 8 | 32 | -- | 5 | -- |
| 1926 | 117 | 63 | 19 | 9 | 7 | 19 | 8 | 55 | -- | 4 | -- |
| 1927 | 113 | 57 | 12 | 8 | 8 | 19 | 9 | 56 | -- | 20 | -- |
| 1928 | 136 | 70 | 11 | 12 | 15 | 22 | 10 | 65 | -- | 27 | -- |
| 1929 | 179 | 93 | 19 | 19 | 16 | 25 | 14 | 86 | -- | 35 | -- |
| 1930 | 160 | 76 | 10 | 16 | 13 | 26 | 12 | 84 | -- | 37 | -- |
| 1931 | 124 | 55 | 10 | 10 | 9 | 18 | 9 | 69 | -- | 22 | -- |
| 1932 | 85 | 41 | 8 | 7 | 8 | 12 | 5 | 44 | -- | 13 | -- |
| 1933 | 98 | 49 | 11 | 9 | 8 | 15 | 6 | 49 | -- | 18 | -- |
| 1934 | 127 | 75 | 23 | 8 | 11 | 26 | 6 | 52 | -- | 18 | -- |
| 1935 | 139 | 77 | 22 | 10 | 14 | 24 | 7 | 62 | -- | 23 | -- |
| 1936 | 137 | 71 | 15 | 9 | 14 | 26 | 7 | 66 | -- | 27 | -- |
| 1937 | 177 | 94 | 17 | 15 | 20 | 29 | 13 | 83 | 35 | 31 | 17 |
| 1938 | 156 | 71 | 6 | 9 | 16 | 27 | 13 | 85 | 42 | 24 | 20 |
| 1939 | 198 | 97 | 13 | 15 | 21 | 33 | 13 | 101 | 57 | 28 | 16 |
| 1940 | 490 | 254 | 44 | 43 | 53 | 96 | 19 | 236 | 152 | 27 | 57 |
| 1941 | 399 | 264 | 70 | 41 | 46 | 82 | 24 | 135 | 64 | 29 | 42 |
| 1942 | 264 | 161 | 42 | 21 | 38 | 45 | 15 | 103 | 59 | 19 | 25 |
| 1943 | 255 | 182 | 35 | 22 | 58 | 46 | 20 | 73 | 38 | 10 | 26 |
| 1944 | 254 | 180 | 31 | 22 | 68 | 42 | 17 | 73 | 43 | 13 | 17 |
| 1945 | 396 | 255 | 44 | 49 | 86 | 51 | 26 | 141 | 74 | 45 | 22 |
| 1946 | 305 | 217 | 28 | 44 | 81 | 49 | 16 | 88 | 37 | 27 | 24 |
| 1947 | 352 | 214 | 28 | 54 | 68 | 46 | 17 | 138 | 60 | 41 | 37 |
| 1948 | 295 | 161 | 28 | 44 | 45 | 31 | 13 | 134 | 62 | 36 | 36 |
| 1949 | 295 | 181 | 39 | 40 | 44 | 39 | 19 | 114 | 55 | 25 | 34 |
| 1950 | 297 | 175 | 44 | 27 | 39 | 50 | 16 | 122 | 60 | 23 | 39 |
| 1951 | 528 | 277 | 71 | 52 | 48 | 89 | 17 | 251 | 135 | 25 | 91 |
| 1952 | 499 | 326 | 105 | 66 | 40 | 101 | 13 | 174 | 93 | 25 | 56 |
| 1953 | 383 | 189 | 47 | 27 | 34 | 67 | 15 | 194 | 110 | 21 | 62 |
| 1954 | 591 | 326 | 140 | 41 | 41 | 88 | 17 | 264 | 170 | 23 | 71 |
| 1955 | 736 | 414 | 207 | 50 | 42 | 97 | 17 | 322 | 213 | 26 | 82 |
| 1956 | 669 | 340 | 152 | 45 | 34 | 89 | 20 | 329 | 213 | 29 | 87 |
| 1957 | 751 | 387 | 174 | 47 | 39 | 104 | 24 | 364 | 255 | 26 | 83 |
| 1958 | 728 | 346 | 127 | 52 | 33 | 109 | 25 | 382 | 267 | 20 | 95 |
| 1959 | 793 | 329 | 120 | 57 | 32 | 92 | 28 | 463 | 350 | 20 | 93 |
| 1960 | 897 | 361 | 135 | 55 | 34 | 111 | 27 | 536 | 406 | 20 | 109 |
| 1961 | 1,042 | 405 | 182 | 48 | 34 | 115 | 26 | 636 | 468 | 22 | 147 |
| 1962 | 1,001 | 349 | 110 | 48 | 32 | 135 | 23 | 652 | 489 | 22 | 141 |
| 1963 | 1,149 | 382 | 118 | 53 | 30 | 157 | 24 | 757 | 599 | 27 | 142 |
| 1964 | 1,496 | 432 | 118 | 68 | 33 | 182 | 31 | 1,064 | 872 | 30 | 162 |
| 1965 [4] | 1,639 | 498 | 84 | 67 | 49 | 432 | 26 | 1,141 | 960 | 29 | 153 |
| 1966 [4] | 1,799 | 587 | 99 | 61 | 55 | 355 | 18 | 1,211 | 1,024 | 35 | 153 |

[1] Data may not add to totals because of rounding.
[2] Includes groundwood paper.
[3] Includes exports of boxboard (bending and nonbending) for the years 1937–49.
[4] Preliminary.
Sources: See source note table 1.

TABLE 20.—*Exports of paper and board from the United States, by grade and major region of destination, 1964*

[Thousand tons]

| Region | Total paper and board | Paper | | | | | | Board | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Newsprint | Book paper | Fine paper | Coarse and industrial paper | Other paper | Total | Container board | Building board | Other board |
| Canada | 144 | 61 | 2 | 12 | 10 | 27 | 10 | 83 | 31 | 10 | 42 |
| Latin America | 392 | 138 | 66 | 21 | 8 | 33 | 10 | 254 | 195 | 4 | 55 |
| Western Europe | 634 | 86 | 4 | 20 | 6 | 55 | 1 | 548 | 505 | 13 | 30 |
| Eastern Europe | 8 | 6 | -- | (1) | -- | 6 | -- | 2 | 2 | -- | -- |
| Africa | 80 | 45 | 10 | 5 | 2 | 22 | 6 | 35 | 26 | 1 | 8 |
| Near and Middle East | 51 | 14 | (1) | (1) | 1 | 11 | 2 | 37 | 35 | 1 | 1 |
| Far East | 160 | 66 | 33 | 6 | 4 | 22 | 1 | 94 | 77 | 1 | 16 |
| Oceania | 27 | 16 | 3 | 4 | 2 | 6 | 1 | 11 | 1 | (1) | 10 |
| Total | 1,496 | 432 | 118 | 68 | 33 | 182 | 31 | 1,064 | 872 | 30 | 162 |

[1] Less than 500 tons.

NOTE: See table 18 for definition of regions.

Source: U.S. Department of Commerce, Bureau of the Census. *U.S. exports: commodity by country.* FT 410. 1964. Annual.

# APPENDIX E

## Production, Trade, and Consumption of Wood Pulp by Type

[Note: The preliminary data for 1965 and 1966 in this appendix were based on information available at the end of February, 1967.]

## Appendix E Contents

TABLE 1.—*Wood pulp production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 3,822 | 906 | 32 | 4,696 | 88 |
| 1921 | 2,876 | 697 | 28 | 3,544 | 65 |
| 1922 | 3,522 | 1,259 | 25 | 4,756 | 86 |
| 1923 | 3,789 | 1,383 | 23 | 5,149 | 92 |
| 1924 | 3,723 | 1,523 | 32 | 5,214 | 91 |
| 1925 | 3,962 | 1,664 | 38 | 5,588 | 97 |
| 1926 | 4,395 | 1,731 | 34 | 6,092 | 104 |
| 1927 | 4,313 | 1,676 | 32 | 5,957 | 100 |
| 1928 | 4,511 | 1,755 | 33 | 6,232 | 103 |
| 1929 | 4,863 | 1,881 | 54 | 6,690 | 110 |
| 1930 | 4,630 | 1,830 | 48 | 6,412 | 104 |
| 1931 | 4,409 | 1,596 | 53 | 5,952 | 96 |
| 1932 | 3,760 | 1,482 | 48 | 5,194 | 83 |
| 1933 | 4,276 | 1,942 | 79 | 6,139 | 98 |
| 1934 | 4,436 | 1,806 | 143 | 6,099 | 97 |
| 1935 | 4,926 | 1,933 | 172 | 6,687 | 105 |
| 1936 | 5,695 | 2,278 | 193 | 7,779 | 121 |
| 1937 | 6,573 | 2,395 | 323 | 8,645 | 134 |
| 1938 | 5,934 | 1,710 | 140 | 7,503 | 116 |
| 1939 | 6,993 | 2,026 | 140 | 8,880 | 136 |
| 1940 | 8,960 | 1,225 | 481 | 9,703 | 147 |
| 1941 | 10,375 | 1,158 | 329 | 11,205 | 168 |
| 1942 | 10,783 | 1,237 | 378 | 11,642 | 173 |
| 1943 | 9,680 | 1,306 | 301 | 10,685 | 156 |
| 1944 | 10,108 | 1,072 | 218 | 10,962 | 158 |
| 1945 | 10,167 | 1,754 | 135 | 11,786 | 168 |
| 1946 | 10,607 | 1,805 | 39 | 12,373 | 175 |
| 1947 | 11,946 | 2,322 | 130 | 14,138 | 196 |
| 1948 | 12,872 | 2,176 | 94 | 14,955 | 204 |
| 1949 | 12,207 | 1,763 | 122 | 13,848 | 186 |
| 1950 | 14,849 | 2,385 | 96 | 17,138 | 225 |
| 1951 | 16,524 | 2,361 | 202 | 18,683 | 241 |
| 1952 | 16,473 | 1,937 | 212 | 18,198 | 231 |
| 1953 | 17,537 | 2,158 | 162 | 19,533 | 244 |
| 1954 | 18,256 | 2,051 | 442 | 19,865 | 244 |
| 1955 | 20,740 | 2,214 | 631 | 22,323 | 269 |
| 1956 | 22,131 | 2,332 | 525 | 23,938 | 283 |
| 1957 | 21,800 | 2,101 | 622 | 23,278 | 271 |
| 1958 | 21,796 | 2,105 | 515 | 23,385 | 267 |
| 1959 | 24,383 | 2,431 | 653 | 26,162 | 294 |
| 1960 | 25,316 | 2,389 | 1,142 | 26,563 | 294 |
| 1961 | 26,523 | 2,467 | 1,178 | 27,812 | 303 |
| 1962 | 27,908 | 2,789 | 1,186 | 29,511 | 316 |
| 1963 | 30,121 | 2,775 | 1,422 | 31,474 | 332 |
| 1964 | 32,429 | 2,942 | 1,580 | 33,791 | 352 |
| 1965 [2] | 33,296 | 3,137 | 1,402 | 35,031 | 360 |
| 1966 [2] | 35,636 | 3,371 | 1,559 | 37,449 | 381 |

[1] Data may not add to total because of rounding.

[2] Preliminary.

NOTE: Total wood pulp production data prior to 1940 contains wood pulp not shown separately by type.

Sources: United States Pulp Producers Association, Inc. *Wood pulp statistics.* New York, 1966. Annual; U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board.* Cur. Indus. Rpts. Ser, M26A. Annual; U.S. Department of Commerce, Business and Defense Services Administration. *Pulp, paper and board.* Quart. Indus. Rpt.; and U.S. Department of Agriculture, Forest Service.

TABLE 2.—*Dissolving and special alpha pulp[1] production, imports, exports, and consumption in the United States, 1935–66* [2]

| Year | U.S. production [3] | Imports [4] | Exports [5] | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1935 | 190 | -- | -- | -- | -- |
| 1936 | 308 | -- | -- | -- | -- |
| 1937 | 354 | 92 | -- | -- | -- |
| 1938 | 228 | 65 | -- | -- | -- |
| 1939 | 193 | 88 | 48 | 233 | 4 |
| 1940 | [6] 327 | 114 | 115 | 326 | 5 |
| 1941 | [6] 261 | 121 | 34 | 348 | 5 |
| 1942 | [6] 404 | 134 | 29 | 509 | 8 |
| 1943 | [6] 390 | 129 | 23 | 497 | 7 |
| 1944 | [6] 447 | 133 | 11 | 569 | 8 |
| 1945 | [6] 383 | 146 | 13 | 516 | 7 |
| 1946 | [6] 317 | 202 | 8 | 510 | 7 |
| 1947 | 407 | 249 | 11 | 645 | 9 |
| 1948 | 420 | 235 | 18 | 637 | 9 |
| 1949 | 374 | 154 | 25 | 503 | 7 |
| 1950 | 479 | 239 | 28 | 690 | 9 |
| 1951 | 616 | 231 | 31 | 816 | 11 |
| 1952 | 706 | 223 | 65 | 863 | 11 |
| 1953 | 677 | 256 | 69 | 864 | 11 |
| 1954 | 760 | 230 | 153 | 838 | 10 |
| 1955 | 983 | 223 | 194 | 1,013 | 12 |
| 1956 | 941 | 193 | 197 | 937 | 11 |
| 1957 | 1,011 | 138 | 250 | 899 | 10 |
| 1958 | 929 | 141 | 223 | 847 | 10 |
| 1959 | 1,100 | 186 | 287 | 999 | 11 |
| 1960 | 1,138 | 232 | 408 | 962 | 11 |
| 1961 | 1,195 | 196 | 435 | 956 | 10 |
| 1962 | 1,267 | 275 | 480 | 1,062 | 11 |
| 1963 | 1,371 | 261 | 524 | 1,109 | 12 |
| 1964 | 1,457 | 274 | 581 | 1,150 | 12 |
| 1965 [7] | 1,486 | 279 | 535 | 1,231 | 13 |
| 1966 [7] | 1,557 | 285 | 582 | 1,260 | 13 |

[1] Includes a number of highly purified grades of wood pulp obtained from the sulfite and sulfate pulping processes.

[2] Data may not add to total because of rounding.

[3] Includes sulfate dissolving pulp beginning in 1950.

[4] Includes sulfate dissolving pulp beginning in 1955.

[5] Includes sulfate dissolving pulp beginning in 1952.

[6] Type data estimated from Census combined data by the United States Pulp Producers Association, Inc.

[7] Preliminary.

Sources: See source note table 1.

TABLE 3.—*Sulfite pulp (paper grades) production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production [2] | Imports [3] | Exports [4] | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 1,586 | 473 | -- | -- | -- |
| 1921 | 1,142 | 328 | -- | -- | -- |
| 1922 | 1,374 | 712 | 18 | 2,068 | 38 |
| 1923 | 1,411 | 798 | 16 | 2,193 | 39 |
| 1924 | 1,337 | 934 | 23 | 2,248 | 39 |
| 1925 | 1,403 | 970 | 25 | 2,348 | 41 |
| 1926 | 1,558 | 1,035 | 23 | 2,569 | 44 |
| 1927 | 1,553 | 1,036 | 27 | 2,562 | 43 |
| 1928 | 1,559 | 1,062 | 25 | 2,596 | 43 |
| 1929 | 1,689 | 1,160 | 44 | 2,805 | 46 |
| 1930 | 1,567 | 1,106 | 35 | 2,638 | 43 |
| 1931 | 1,418 | 963 | 50 | 2,331 | 38 |
| 1932 | 1,146 | 917 | 46 | 2,017 | 32 |
| 1933 | 1,328 | 1,169 | 77 | 2,419 | 39 |
| 1934 | 1,446 | 1,074 | 139 | 2,380 | 38 |
| 1935 | 1,390 | 1,122 | 166 | 2,346 | 37 |
| 1936 | 1,514 | 1,299 | 188 | 2,626 | 41 |
| 1937 | 1,787 | 1,340 | 313 | 2,814 | 44 |
| 1938 | 1,378 | 959 | 124 | 2,213 | 34 |
| 1939 | 1,753 | 1,047 | 64 | 2,736 | 42 |
| 1940 | 2,281 | 612 | 175 | 2,719 | 41 |
| 1941 | 2,658 | 632 | 157 | 3,133 | 47 |
| 1942 | 2,527 | 700 | 177 | 3,050 | 45 |
| 1943 | 2,046 | 751 | 135 | 2,662 | 39 |
| 1944 | 1,939 | 588 | 85 | 2,442 | 35 |
| 1945 | 1,977 | 900 | 44 | 2,833 | 41 |
| 1946 | 2,160 | 841 | 24 | 2,977 | 42 |
| 1947 | 2,389 | 1,020 | 97 | 3,311 | 46 |
| 1948 | 2,392 | 998 | 67 | 3,322 | 45 |
| 1949 | 2,162 | 724 | 59 | 2,827 | 38 |
| 1950 | 2,370 | 930 | 51 | 3,249 | 43 |
| 1951 | 2,525 | 906 | 87 | 3,344 | 43 |
| 1952 | 2,365 | 708 | 58 | 3,015 | 38 |
| 1953 | 2,323 | 714 | 49 | 2,987 | 37 |
| 1954 | 2,383 | 628 | 109 | 2,902 | 36 |
| 1955 | 2,555 | 730 | 118 | 3,167 | 38 |
| 1956 | 2,686 | 797 | 90 | 3,394 | 40 |
| 1957 | 2,575 | 666 | 113 | 3,128 | 36 |
| 1958 | 2,381 | 631 | 66 | 2,946 | 34 |
| 1959 | 2,479 | 633 | 81 | 3,031 | 34 |
| 1960 | 2,578 | 631 | 146 | 3,063 | 34 |
| 1961 | 2,574 | 650 | 150 | 3,074 | 34 |
| 1962 | 2,565 | 678 | 202 | 3,040 | 33 |
| 1963 | 2,689 | 636 | 248 | 3,077 | 32 |
| 1964 | 2,685 | 699 | 272 | 3,112 | 32 |
| 1965 [5] | 2,789 | 714 | 240 | 3,263 | 34 |
| 1966 [5] | 2,804 | 704 | 243 | 3,265 | 33 |

[1] Data may not add to total because of rounding.

[2] Includes dissolving and special alpha pulps for some years prior to 1934.

[3] Includes dissolving and special alpha pulps for some years prior to 1937.

[4] Includes dissolving and special alpha pulps for some years prior to 1939.

[5] Preliminary.

Sources: See source note table 1.

TABLE 4.—*Sulfate pulp (paper grades) production, imports, exports, and consumption in the United States, 1920–66*[1]

| Year | U.S. production [2] | Imports [3] | Exports [4] | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 189 | 200 | -- | 389 | 7 |
| 1921 | 138 | 178 | -- | 316 | 6 |
| 1922 | 244 | 330 | -- | 574 | 10 |
| 1923 | 312 | 279 | -- | 591 | 11 |
| 1924 | 303 | 342 | -- | 645 | 11 |
| 1925 | 410 | 362 | -- | 772 | 13 |
| 1926 | 520 | 393 | -- | 913 | 16 |
| 1927 | 603 | 394 | -- | 997 | 17 |
| 1928 | 774 | 443 | -- | 1,218 | 20 |
| 1929 | 911 | 447 | -- | 1,358 | 22 |
| 1930 | 950 | 422 | -- | 1,372 | 22 |
| 1931 | 1,033 | 419 | -- | 1,453 | 23 |
| 1932 | 1,029 | 374 | -- | 1,403 | 22 |
| 1933 | 1,259 | 558 | -- | 1,818 | 29 |
| 1934 | 1,246 | 536 | -- | 1,782 | 28 |
| 1935 | 1,468 | 611 | -- | 2,079 | 33 |
| 1936 | 1,795 | 738 | -- | 2,533 | 40 |
| 1937 | 2,139 | 734 | -- | 2,873 | 45 |
| 1938 | 2,443 | 518 | -- | 2,961 | 46 |
| 1939 | 2,963 | 654 | -- | 3,602 | 55 |
| 1940 | 3,748 | 308 | 177 | 3,879 | 59 |
| 1941 | 4,527 | 176 | 129 | 4,573 | 69 |
| 1942 | 4,738 | 150 | 168 | 4,720 | 70 |
| 1943 | 4,236 | 152 | 137 | 4,251 | 62 |
| 1944 | 4,549 | 146 | 112 | 4,582 | 66 |
| 1945 | 4,472 | 452 | 66 | 4,858 | 69 |
| 1946 | 4,588 | 478 | 5 | 5,060 | 72 |
| 1947 | 5,357 | 709 | 20 | 6,046 | 84 |
| 1948 | 6,014 | 614 | 7 | 6,621 | 90 |
| 1949 | 5,977 | 640 | 37 | 6,581 | 88 |
| 1950 | 7,501 | 891 | 14 | 8,378 | 110 |
| 1951 | 8,572 | 857 | 81 | 9,348 | 121 |
| 1952 | 8,569 | 727 | 87 | 9,208 | 117 |
| 1953 | 9,445 | 883 | 42 | 10,285 | 128 |
| 1954 | 9,812 | 907 | 174 | 10,545 | 129 |
| 1955 | 11,289 | 954 | 310 | 11,933 | 144 |
| 1956 | 12,131 | 1,014 | 231 | 12,914 | 153 |
| 1957 | 11,935 | 1,017 | 255 | 12,697 | 148 |
| 1958 | 12,316 | 1,094 | 222 | 13,189 | 151 |
| 1959 | 13,829 | 1,347 | 281 | 14,895 | 168 |
| 1960 | 14,590 | 1,221 | 584 | 15,227 | 169 |
| 1961 | 15,422 | 1,271 | 587 | 16,106 | 175 |
| 1962 | 16,301 | 1,474 | 500 | 17,275 | 185 |
| 1963 | 17,941 | 1,502 | 644 | 18,800 | 199 |
| 1964 | 20,006 | 1,584 | 725 | 20,865 | 217 |
| 1965 [5] | 20,514 | 1,773 | 621 | 21,665 | 223 |
| 1966 [5] | 22,353 | 2,057 | 725 | 23,684 | 241 |

[1] Data may not add to total because of rounding.
[2] Includes sulfate dissolving pulp prior to 1950.
[3] Includes sulfate dissolving pulp prior to 1955.
[4] Includes sulfate dissolving pulp prior to 1952.
[5] Preliminary.
Sources: See source note table 1.

TABLE 5.—*Soda pulp production, imports, exports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production | Imports | Exports | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 463 | -- | -- | -- | -- |
| 1921 | 301 | -- | -- | -- | -- |
| 1922 | 420 | 1 | 4 | 417 | 8 |
| 1923 | 445 | 6 | 3 | 448 | 8 |
| 1924 | 441 | -- | 2 | 439 | 8 |
| 1925 | 473 | -- | 3 | 470 | 8 |
| 1926 | 497 | -- | 2 | 495 | 8 |
| 1927 | 487 | -- | 2 | 485 | 8 |
| 1928 | 489 | -- | 3 | 486 | 8 |
| 1929 | 521 | -- | 2 | 519 | 9 |
| 1930 | 474 | 2 | 2 | 474 | 8 |
| 1931 | 374 | 3 | 1 | 376 | 6 |
| 1932 | 291 | 2 | 1 | 291 | 5 |
| 1933 | [2] 388 | 4 | 1 | 391 | 6 |
| 1934 | [2] 354 | 7 | 2 | 361 | 6 |
| 1935 | [2] 418 | 9 | 2 | 425 | 7 |
| 1936 | [2] 479 | 13 | 5 | 487 | 8 |
| 1937 | 508 | 10 | 8 | 510 | 8 |
| 1938 | 395 | 9 | 3 | 402 | 6 |
| 1939 | 442 | 9 | 4 | 447 | 7 |
| 1940 | 532 | 11 | 10 | 533 | 8 |
| 1941 | 480 | 16 | 2 | 494 | 7 |
| 1942 | 462 | 18 | 3 | 477 | 7 |
| 1943 | 419 | 20 | 5 | 434 | 6 |
| 1944 | 413 | 16 | 11 | 419 | 6 |
| 1945 | 430 | 21 | 10 | 441 | 6 |
| 1946 | 476 | 20 | -- | 496 | 7 |
| 1947 | 492 | 21 | 1 | 512 | 7 |
| 1948 | 510 | 25 | 1 | 534 | 7 |
| 1949 | 492 | 27 | -- | 519 | 7 |
| 1950 | 522 | 34 | -- | 556 | 7 |
| 1951 | 446 | 33 | 1 | 479 | 6 |
| 1952 | 425 | 28 | -- | 453 | 6 |
| 1953 | 428 | 36 | -- | 464 | 6 |
| 1954 | 430 | 38 | [2] 2 | 466 | 6 |
| 1955 | 440 | 41 | [2] 5 | 477 | 6 |
| 1956 | 479 | 43 | [2] 2 | 519 | 6 |
| 1957 | 428 | 37 | [2] 1 | 464 | 5 |
| 1958 | 429 | 27 | [2] 1 | 455 | 5 |
| 1959 | 481 | 28 | [2] 1 | 507 | 6 |
| 1960 | 420 | 32 | [2] 1 | 450 | 5 |
| 1961 | 436 | 28 | [2] 2 | 463 | 5 |
| 1962 | 425 | 25 | [2] 1 | 449 | 5 |
| 1963 | 390 | 27 | [2] 1 | 417 | 4 |
| 1964 | 350 | 28 | [2] 1 | 378 | 4 |
| 1965 [3] | 229 | 8 | [2] -- | 236 | 2 |
| 1966 [3] | 190 | (4) | -- | 191 | 2 |

[1] Data may not add to total because of rounding.
[2] Type data for the years 1933–36 and 1954–65 estimated from Census combined data by the United States Pulp Producers Association, Inc.
[3] Preliminary.
[4] Less than 500 tons.
Sources: See source note table 1.

TABLE 6.—*Groundwood pulp production, imports, and consumption in the United States, 1920–66* [1]

| Year | U.S. production [2] | Imports | Apparent consumption [2] | Per capita consumption |
|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1920 | 1,584 | 233 | 1,817 | 34 |
| 1921 | 1,260 | 191 | 1,450 | 27 |
| 1922 | 1,484 | 216 | 1,700 | 31 |
| 1923 | 1,568 | 300 | 1,868 | 33 |
| 1924 | 1,643 | 246 | 1,889 | 33 |
| 1925 | 1,612 | 331 | 1,943 | 34 |
| 1926 | 1,764 | 304 | 2,068 | 35 |
| 1927 | 1,610 | 246 | 1,856 | 31 |
| 1928 | 1,611 | 249 | 1,860 | 31 |
| 1929 | 1,638 | 273 | 1,911 | 31 |
| 1930 | 1,560 | 299 | 1,859 | 30 |
| 1931 | 1,449 | 211 | 1,660 | 27 |
| 1932 | 1,203 | 188 | 1,392 | 22 |
| 1933 | 1,198 | 210 | 1,408 | 22 |
| 1934 | 1,297 | 189 | 1,486 | 24 |
| 1935 | 1,356 | 190 | 1,546 | 24 |
| 1936 | 1,476 | 228 | 1,703 | 27 |
| 1937 | 1,601 | 218 | 1,819 | 28 |
| 1938 | 1,333 | 159 | 1,492 | 23 |
| 1939 | 1,445 | 228 | 1,673 | 26 |
| 1940 | 1,633 | 171 | 1,804 | 27 |
| 1941 | 1,886 | 198 | 2,084 | 31 |
| 1942 | 1,870 | 220 | 2,090 | 31 |
| 1943 | 1,767 | 236 | 2,003 | 29 |
| 1944 | 1,769 | 177 | 1,946 | 28 |
| 1945 | 1,827 | 223 | 2,049 | 29 |
| 1946 | 1,951 | 250 | 2,202 | 31 |
| 1947 | 2,050 | 309 | 2,359 | 33 |
| 1948 | 2,175 | 291 | 2,466 | 34 |
| 1949 | 1,960 | 209 | 2,169 | 29 |
| 1950 | 2,216 | 281 | 2,496 | 33 |
| 1951 | 2,474 | 318 | 2,792 | 36 |
| 1952 | 2,321 | 242 | 2,563 | 33 |
| 1953 | 2,343 | 259 | 2,602 | 32 |
| 1954 | 2,485 | 237 | 2,722 | 33 |
| 1955 | 2,729 | 254 | 2,983 | 36 |
| 1956 | 3,041 | 271 | 3,312 | 39 |
| 1957 | 3,089 | 228 | 3,317 | 39 |
| 1958 | 2,890 | 199 | 3,089 | 35 |
| 1959 | 3,230 | 229 | 3,458 | 39 |
| 1960 | 3,292 | 262 | 3,554 | 39 |
| 1961 | 3,208 | 310 | 3,518 | 38 |
| 1962 | 3,397 | 328 | 3,726 | 40 |
| 1963 | 3,468 | 339 | 3,807 | 40 |
| 1964 | 3,596 | 348 | 3,944 | 41 |
| 1965 [3] | 3,920 | 346 | 4,266 | 44 |
| 1966 [3] | 3,972 | 303 | 4,275 | 43 |

[1] Data may not add to total because of rounding.

[2] Includes exploded wood pulp for the years 1926–40.

[3] Preliminary.

NOTE: Exports of groundwood pulp are included with exports of defibrated or exploded pulp (table 8).

Sources: See source note table 1.

TABLE 7.—*Semichemical pulp production and consumption in the United States, 1929–66*

| Year | U.S. production | Apparent consumption | Per capita consumption |
|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1929 | 40 | 40 | 1 |
| 1930 | 30 | 30 | 1 |
| 1931 | 87 | 87 | 1 |
| 1932 | 67 | 67 | 1 |
| 1933 | [1] 70 | 70 | 1 |
| 1934 | [1] 57 | 57 | 1 |
| 1935 | [1] 67 | 67 | 1 |
| 1936 | [1] 79 | 79 | 1 |
| 1937 | 133 | 133 | 2 |
| 1938 | 119 | 119 | 2 |
| 1939 | 152 | 152 | 2 |
| 1940 | [1] 165 | 165 | 3 |
| 1941 | [1] 200 | 200 | 3 |
| 1942 | [1] 210 | 210 | 3 |
| 1943 | [1] 231 | 231 | 3 |
| 1944 | [1] 285 | 285 | 4 |
| 1945 | [1] 295 | 295 | 4 |
| 1946 | [1] 320 | 320 | 5 |
| 1947 | 444 | 444 | 6 |
| 1948 | 478 | 478 | 7 |
| 1949 | 506 | 506 | 7 |
| 1950 | 686 | 686 | 9 |
| 1951 | 803 | 803 | 10 |
| 1952 | 829 | 829 | 11 |
| 1953 | 1,029 | 1,029 | 13 |
| 1954 | 1,198 | 1,198 | 15 |
| 1955 | 1,408 | 1,408 | 17 |
| 1956 | 1,547 | 1,547 | 18 |
| 1957 | 1,583 | 1,583 | 18 |
| 1958 | 1,622 | 1,622 | 19 |
| 1959 | 1,924 | 1,924 | 22 |
| 1960 | 1,991 | 1,991 | 22 |
| 1961 | 2,352 | 2,352 | 26 |
| 1962 | 2,543 | 2,543 | 27 |
| 1963 | 2,629 | 2,629 | 28 |
| 1964 | 2,712 | 2,712 | 28 |
| 1965 [2] | 2,885 | 2,885 | 30 |
| 1966 [2] | 3,231 | 3,231 | 33 |

[1] Type data for the years 1933–36 and 1940–46 estimated from Census combined data by the United States Pulp Producers Association, Inc.

[2] Preliminary.

NOTE: Imports and exports of semichemical pulp are included with imports and exports of defibrated or exploded pulp (table 8).

Sources: See source note table 1.

TABLE 8.—*Defibrated or exploded pulp (includes screenings) production, imports, exports, and consumption in the United States, 1940–66* [1]

| Year | U.S. production | Imports[2] | Exports[3 4] | Apparent consumption | Per capita consumption |
|---|---|---|---|---|---|
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Pounds* |
| 1940 | 274 | 8 | 4 | 278 | 4 |
| 1941 | 363 | 15 | 7 | 371 | 6 |
| 1942 | 573 | 14 | 1 | 586 | 9 |
| 1943 | 591 | 17 | 1 | 607 | 9 |
| 1944 | 706 | 12 | [5] | 718 | 10 |
| 1945 | 783 | 12 | 2 | 793 | 11 |
| 1946 | 795 | 15 | 1 | 809 | 11 |
| 1947 | 808 | 14 | 2 | 819 | 11 |
| 1948 | 885 | 13 | 1 | 896 | 12 |
| 1949 | 735 | 9 | 1 | 743 | 10 |
| 1950 | 1,075 | 10 | 3 | 1,083 | 14 |
| 1951 | 1,088 | 15 | 2 | 1,101 | 14 |
| 1952 | 1,258 | 8 | 1 | 1,265 | 16 |
| 1953 | 1,293 | 11 | 2 | 1,303 | 16 |
| 1954 | 1,189 | 11 | 4 | 1,196 | 15 |
| 1955 | 1,335 | 12 | 4 | 1,342 | 16 |
| 1956 | 1,306 | 15 | 6 | 1,316 | 16 |
| 1957 | 1,180 | 15 | 3 | 1,191 | 14 |
| 1958 | 1,228 | 13 | 4 | 1,237 | 14 |
| 1959 | 1,340 | 10 | 3 | 1,347 | 15 |
| 1960 | 1,307 | 12 | 3 | 1,316 | 15 |
| 1961 | 1,335 | 12 | 4 | 1,343 | 15 |
| 1962 | 1,411 | 9 | 3 | 1,416 | 15 |
| 1963 | 1,632 | 9 | 5 | 1,636 | 17 |
| 1964 | 1,621 | 9 | 1 | 1,629 | 17 |
| 1965 [6] | 1,473 | 17 | 6 | 1,485 | 15 |
| 1966 [6] | 1,530 | 22 | 9 | 1,544 | 16 |

[1] Data may not add to total because of rounding.

[2] Includes chemical and mechanical screenings.

[3] Includes screenings and miscellaneous wood pulp.

[4] Type data for the years 1954–65, estimated from Census combined data by the United States Pulp Producers Association, Inc.

[5] Less than 500 tons.

[6] Preliminary.

Sources: See source note table 1.

TABLE 9.—*Apparent consumption of wood pulp in the United States, by type, 1920–66* [1]

[Thousand tons]

| Year | Total wood pulp | Dissolving and special alpha | Sulfite | Sulfate | Soda | Ground-wood | Semi-chemical | Defibrated or exploded[2] |
|---|---|---|---|---|---|---|---|---|
| 1920 | 4,696 | -- | -- | 389 | -- | 1,817 | -- | -- |
| 1921 | 3,544 | -- | -- | 316 | -- | 1,450 | -- | -- |
| 1922 | 4,756 | -- | 2,068 | 574 | 417 | 1,700 | -- | -- |
| 1923 | 5,149 | -- | 2,193 | 591 | 448 | 1,868 | -- | -- |
| 1924 | 5,214 | -- | 2,248 | 645 | 439 | 1,889 | -- | -- |
| 1925 | 5,588 | -- | 2,348 | 772 | 470 | 1,943 | -- | -- |
| 1926 | 6,092 | -- | 2,569 | 913 | 495 | 2,068 | -- | -- |
| 1927 | 5,957 | -- | 2,562 | 997 | 485 | 1,856 | -- | -- |
| 1928 | 6,232 | -- | 2,596 | 1,218 | 486 | 1,860 | -- | -- |
| 1929 | 6,690 | -- | 2,805 | 1,358 | 519 | 1,911 | 40 | -- |
| 1930 | 6,412 | -- | 2,638 | 1,372 | 474 | 1,859 | 30 | -- |
| 1931 | 5,952 | -- | 2,331 | 1,453 | 376 | 1,660 | 87 | -- |
| 1932 | 5,194 | -- | 2,017 | 1,403 | 291 | 1,392 | 67 | -- |
| 1933 | 6,139 | -- | 2,419 | 1,818 | 391 | 1,408 | 70 | -- |
| 1934 | 6,099 | -- | 2,380 | 1,782 | 361 | 1,486 | 57 | -- |
| 1935 | 6,687 | -- | 2,346 | 2,079 | 425 | 1,546 | 67 | -- |
| 1936 | 7,779 | -- | 2,626 | 2,533 | 487 | 1,703 | 79 | -- |
| 1937 | 8,645 | -- | 2,814 | 2,873 | 510 | 1,819 | 133 | -- |
| 1938 | 7,503 | -- | 2,213 | 2,961 | 402 | 1,492 | 119 | -- |
| 1939 | 8,880 | 233 | 2,736 | 3,602 | 447 | 1,673 | 152 | -- |
| 1940 | 9,703 | 326 | 2,719 | 3,879 | 533 | 1,804 | 165 | 278 |
| 1941 | 11,205 | 348 | 3,133 | 4,573 | 494 | 2,084 | 200 | 371 |
| 1942 | 11,642 | 509 | 3,050 | 4,720 | 477 | 2,090 | 210 | 586 |
| 1943 | 10,685 | 497 | 2,662 | 4,251 | 434 | 2,003 | 231 | 607 |
| 1944 | 10,962 | 569 | 2,442 | 4,582 | 419 | 1,946 | 285 | 718 |
| 1945 | 11,786 | 516 | 2,833 | 4,858 | 441 | 2,049 | 295 | 793 |
| 1946 | 12,373 | 510 | 2,977 | 5,060 | 496 | 2,202 | 320 | 809 |
| 1947 | 14,138 | 645 | 3,311 | 6,046 | 512 | 2,359 | 444 | 819 |
| 1948 | 14,955 | 637 | 3,322 | 6,621 | 534 | 2,466 | 478 | 896 |
| 1949 | 13,848 | 503 | 2,827 | 6,581 | 519 | 2,169 | 506 | 743 |
| 1950 | 17,138 | 690 | 3,249 | 8,378 | 556 | 2,496 | 686 | 1,083 |
| 1951 | 18,683 | 816 | 3,344 | 9,348 | 479 | 2,792 | 803 | 1,101 |
| 1952 | 18,198 | 863 | 3,015 | 9,208 | 453 | 2,563 | 829 | 1,265 |
| 1953 | 19,533 | 864 | 2,987 | 10,285 | 464 | 2,602 | 1,029 | 1,303 |
| 1954 | 19,865 | 838 | 2,902 | 10,545 | 466 | 2,722 | 1,198 | 1,196 |
| 1955 | 22,323 | 1,013 | 3,167 | 11,933 | 477 | 2,983 | 1,408 | 1,342 |
| 1956 | 23,938 | 937 | 3,394 | 12,914 | 519 | 3,312 | 1,547 | 1,316 |
| 1957 | 23,278 | 899 | 3,128 | 12,697 | 464 | 3,317 | 1,583 | 1,191 |
| 1958 | 23,385 | 847 | 2,946 | 13,189 | 455 | 3,089 | 1,622 | 1,237 |
| 1959 | 26,162 | 999 | 3,031 | 14,895 | 507 | 3,458 | 1,924 | 1,347 |
| 1960 | 26,563 | 962 | 3,063 | 15,227 | 450 | 3,554 | 1,991 | 1,316 |
| 1961 | 27,812 | 956 | 3,074 | 16,106 | 463 | 3,518 | 2,352 | 1,343 |
| 1962 | 29,511 | 1,062 | 3,040 | 17,275 | 449 | 3,726 | 2,543 | 1,416 |
| 1963 | 31,474 | 1,109 | 3,077 | 18,800 | 417 | 3,807 | 2,629 | 1,636 |
| 1964 | 33,791 | 1,150 | 3,112 | 20,865 | 378 | 3,944 | 2,712 | 1,629 |
| 1965 [3] | 35,031 | 1,231 | 3,263 | 21,665 | 236 | 4,266 | 2,885 | 1,485 |
| 1966 [3] | 37,449 | 1,260 | 3,265 | 23,684 | 191 | 4,275 | 3,231 | 1,544 |

[1] Data may not add to total because of rounding.

[2] Includes chemical and mechanical screenings.

[3] Preliminary.

NOTE: Total wood pulp consumption data prior to 1940 contains wood pulp not shown separately by type.

Sources: See source note table 1.

TABLE 10.—*Apparent per capita consumption of wood pulp in the United States, by type, 1920–66* [1]

[Pounds]

| Year | Total wood pulp | Dissolving and special alpha | Sulfite | Sulfate | Soda | Ground-wood | Semi-chemical | Defibrated or exploded[2] |
|---|---|---|---|---|---|---|---|---|
| 1920 | 88 | -- | -- | 7 | -- | 34 | -- | -- |
| 1921 | 65 | -- | -- | 6 | -- | 27 | -- | -- |
| 1922 | 86 | -- | 38 | 10 | 8 | 31 | -- | -- |
| 1923 | 92 | -- | 39 | 11 | 8 | 33 | -- | -- |
| 1924 | 91 | -- | 39 | 11 | 8 | 33 | -- | -- |
| 1925 | 97 | -- | 41 | 13 | 8 | 34 | -- | -- |
| 1926 | 104 | -- | 44 | 16 | 8 | 35 | -- | -- |
| 1927 | 100 | -- | 43 | 17 | 8 | 31 | -- | -- |
| 1928 | 103 | -- | 43 | 20 | 8 | 31 | -- | -- |
| 1929 | 110 | -- | 46 | 22 | 9 | 31 | 1 | -- |
| 1930 | 104 | -- | 43 | 22 | 8 | 30 | 1 | -- |
| 1931 | 96 | -- | 38 | 23 | 6 | 27 | 1 | -- |
| 1932 | 83 | -- | 32 | 22 | 5 | 22 | 1 | -- |
| 1933 | 98 | -- | 39 | 29 | 6 | 22 | 1 | -- |
| 1934 | 97 | -- | 38 | 28 | 6 | 24 | 1 | -- |
| 1935 | 105 | -- | 37 | 33 | 7 | 24 | 1 | -- |
| 1936 | 121 | -- | 41 | 40 | 8 | 27 | 1 | -- |
| 1937 | 134 | -- | 44 | 45 | 8 | 28 | 2 | -- |
| 1938 | 116 | -- | 34 | 46 | 6 | 23 | 2 | -- |
| 1939 | 136 | 4 | 42 | 55 | 7 | 26 | 2 | -- |
| 1940 | 147 | 5 | 41 | 59 | 8 | 27 | 3 | 4 |
| 1941 | 168 | 5 | 47 | 69 | 7 | 31 | 3 | 6 |
| 1942 | 173 | 8 | 45 | 70 | 7 | 31 | 3 | 9 |
| 1943 | 156 | 7 | 39 | 62 | 6 | 29 | 3 | 9 |
| 1944 | 158 | 8 | 35 | 66 | 6 | 28 | 4 | 10 |
| 1945 | 168 | 7 | 41 | 69 | 6 | 29 | 4 | 11 |
| 1946 | 175 | 7 | 42 | 72 | 7 | 31 | 5 | 11 |
| 1947 | 196 | 9 | 46 | 84 | 7 | 33 | 6 | 11 |
| 1948 | 204 | 9 | 45 | 90 | 7 | 34 | 7 | 12 |
| 1949 | 186 | 7 | 38 | 88 | 7 | 29 | 7 | 10 |
| 1950 | 225 | 9 | 43 | 110 | 7 | 33 | 9 | 14 |
| 1951 | 241 | 11 | 43 | 121 | 6 | 36 | 10 | 14 |
| 1952 | 231 | 11 | 38 | 117 | 6 | 33 | 11 | 16 |
| 1953 | 244 | 11 | 37 | 128 | 6 | 32 | 13 | 16 |
| 1954 | 244 | 10 | 36 | 129 | 6 | 33 | 15 | 15 |
| 1955 | 269 | 12 | 38 | 144 | 6 | 36 | 17 | 16 |
| 1956 | 283 | 11 | 40 | 153 | 6 | 39 | 18 | 16 |
| 1957 | 271 | 10 | 36 | 148 | 5 | 39 | 18 | 14 |
| 1958 | 267 | 10 | 34 | 151 | 5 | 35 | 19 | 14 |
| 1959 | 294 | 11 | 34 | 168 | 6 | 39 | 22 | 15 |
| 1960 | 294 | 11 | 34 | 169 | 5 | 39 | 22 | 15 |
| 1961 | 303 | 10 | 34 | 175 | 5 | 38 | 26 | 15 |
| 1962 | 316 | 11 | 33 | 185 | 5 | 40 | 27 | 15 |
| 1963 | 332 | 12 | 32 | 199 | 4 | 40 | 28 | 17 |
| 1964 | 352 | 12 | 32 | 217 | 4 | 41 | 28 | 17 |
| 1965 [3] | 360 | 13 | 34 | 223 | 2 | 44 | 30 | 15 |
| 1966 [3] | 381 | 13 | 33 | 241 | 2 | 43 | 33 | 16 |

[1] Data may not add to total because of rounding.

[2] Includes chemical and mechanical screenings.

[3] Preliminary.

NOTE: Total wood pulp consumption data prior to 1940 contains wood pulp not shown separately by type.

Sources: Derived from data published by the United States Pulp Producers Association, Inc., and the U.S. Department of Commerce, see source note table 1.

TABLE 11.—*Imports and exports of wood pulp in the United States, by type, 1920–66* [1]

[Thousand tons]

| Year | Imports | | | | | | | Exports | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total wood pulp | Dissolving and special alpha[2] | Sulfite[3] | Sulfate[4] | Soda | Ground-wood | All otber[5] | Total wood pulp | Dissolving and special alpha[6] | Sulfite[7] | Sulfate[8] | Soda[9] | All other[9 10] |
| 1920 | 906 | -- | 473 | 200 | -- | 233 | -- | 32 | -- | -- | -- | -- | -- |
| 1921 | 697 | -- | 328 | 178 | -- | 191 | -- | 28 | -- | -- | -- | -- | -- |
| 1922 | 1,259 | -- | 712 | 330 | 1 | 216 | -- | 25 | -- | 18 | -- | 4 | 3 |
| 1923 | 1,383 | -- | 798 | 279 | 6 | 300 | -- | 23 | -- | 16 | -- | 3 | 3 |
| 1924 | 1,523 | -- | 934 | 342 | -- | 246 | -- | 38 | -- | 23 | -- | 2 | 7 |
| 1925 | 1,664 | -- | 970 | 362 | -- | 331 | -- | 38 | -- | 25 | -- | 3 | 10 |
| 1926 | 1,731 | -- | 1,035 | 393 | -- | 304 | -- | 34 | -- | 23 | -- | 2 | 9 |
| 1927 | 1,676 | -- | 1,036 | 394 | -- | 246 | -- | 32 | -- | 27 | -- | 2 | 3 |
| 1928 | 1,755 | -- | 1,062 | 443 | -- | 249 | -- | 33 | -- | 25 | -- | 3 | 6 |
| 1929 | 1,881 | -- | 1,160 | 447 | -- | 273 | -- | 54 | -- | 44 | -- | 2 | 8 |
| 1930 | 1,830 | -- | 1,106 | 422 | 2 | 299 | -- | 48 | -- | 35 | -- | 2 | 11 |
| 1931 | 1,596 | -- | 963 | 419 | 3 | 211 | -- | 53 | -- | 50 | -- | 1 | 2 |
| 1932 | 1,482 | -- | 917 | 374 | 2 | 188 | -- | 48 | -- | 46 | -- | 1 | 1 |
| 1933 | 1,942 | -- | 1,169 | 558 | 4 | 210 | -- | 79 | -- | 77 | -- | 1 | 1 |
| 1934 | 1,806 | -- | 1,074 | 536 | 7 | 189 | -- | 143 | -- | 139 | -- | 2 | 2 |
| 1935 | 1,933 | -- | 1,122 | 611 | 9 | 190 | -- | 172 | -- | 166 | -- | 2 | 3 |
| 1936 | 2,278 | -- | 1,299 | 738 | 13 | 228 | -- | 193 | -- | 188 | -- | 5 | 1 |
| 1937 | 2,395 | 92 | 1,340 | 734 | 10 | 218 | -- | 323 | -- | 313 | -- | 8 | 2 |
| 1938 | 1,710 | 65 | 959 | 518 | 9 | 159 | -- | 140 | -- | 124 | -- | 3 | 14 |
| 1939 | 2,026 | 88 | 1,047 | 654 | 9 | 228 | -- | 140 | 48 | 64 | -- | 4 | 8 |
| 1940 | 1,225 | 114 | 612 | 308 | 11 | 171 | 8 | 481 | 115 | 175 | 177 | 10 | 4 |
| 1941 | 1,158 | 121 | 632 | 176 | 16 | 198 | 15 | 329 | 34 | 157 | 129 | 2 | 7 |
| 1942 | 1,237 | 134 | 700 | 150 | 18 | 220 | 14 | 378 | 29 | 177 | 168 | 3 | 1 |
| 1943 | 1,306 | 129 | 751 | 152 | 20 | 236 | 17 | 301 | 23 | 135 | 137 | 5 | 1 |
| 1944 | 1,072 | 133 | 588 | 146 | 16 | 177 | 12 | 218 | 11 | 85 | 112 | 11 | (11) |
| 1945 | 1,754 | 146 | 900 | 452 | 21 | 223 | 12 | 135 | 13 | 44 | 66 | 10 | 2 |
| 1946 | 1,805 | 202 | 841 | 478 | 20 | 250 | 15 | 39 | 8 | 24 | 5 | -- | 1 |
| 1947 | 2,322 | 249 | 1,020 | 709 | 21 | 309 | 14 | 130 | 11 | 97 | 20 | 1 | 2 |
| 1948 | 2,176 | 235 | 998 | 614 | 25 | 291 | 13 | 94 | 18 | 67 | 7 | 1 | 1 |
| 1949 | 1,763 | 154 | 724 | 640 | 27 | 209 | 9 | 122 | 25 | 59 | 37 | -- | 1 |
| 1950 | 2,385 | 239 | 930 | 891 | 34 | 281 | 10 | 96 | 28 | 51 | 14 | -- | 3 |
| 1951 | 2,361 | 231 | 906 | 857 | 33 | 318 | 15 | 202 | 31 | 87 | 81 | 1 | 2 |
| 1952 | 1,937 | 223 | 708 | 727 | 28 | 242 | 8 | 212 | 65 | 58 | 87 | -- | 1 |
| 1953 | 2,158 | 256 | 714 | 883 | 36 | 259 | 11 | 162 | 69 | 49 | 42 | -- | 2 |
| 1954 | 2,051 | 230 | 628 | 907 | 38 | 237 | 11 | 442 | 153 | 109 | 174 | 2 | 4 |
| 1955 | 2,214 | 223 | 730 | 954 | 41 | 254 | 12 | 631 | 194 | 118 | 310 | 5 | 4 |
| 1956 | 2,332 | 193 | 797 | 1,014 | 43 | 271 | 15 | 525 | 197 | 90 | 231 | 2 | 6 |
| 1957 | 2,101 | 138 | 666 | 1,017 | 37 | 228 | 15 | 622 | 250 | 113 | 255 | 1 | 3 |
| 1958 | 2,105 | 141 | 631 | 1,094 | 27 | 199 | 13 | 515 | 223 | 66 | 222 | 1 | 4 |
| 1959 | 2,431 | 186 | 633 | 1,347 | 28 | 229 | 10 | 653 | 287 | 81 | 281 | 1 | 3 |
| 1960 | 2,389 | 232 | 631 | 1,221 | 32 | 262 | 12 | 1,142 | 408 | 146 | 584 | 1 | 3 |
| 1961 | 2,467 | 196 | 650 | 1,271 | 28 | 310 | 12 | 1,178 | 435 | 150 | 587 | 2 | 4 |
| 1962 | 2,789 | 275 | 678 | 1,474 | 25 | 328 | 9 | 1,186 | 480 | 202 | 500 | 1 | 3 |
| 1963 | 2,775 | 261 | 636 | 1,502 | 27 | 339 | 9 | 1,422 | 524 | 248 | 644 | 1 | 5 |
| 1964 | 2,942 | 274 | 699 | 1,584 | 28 | 348 | 9 | 1,580 | 581 | 272 | 725 | 1 | 1 |
| 1965 [12] | 3,137 | 279 | 714 | 1,773 | 8 | 346 | 17 | 1,402 | 535 | 240 | 621 | -- | 6 |
| 1966 [12] | 3,371 | 285 | 704 | 2,057 | (11) | 303 | 22 | 1,559 | 582 | 243 | 725 | -- | 9 |

[1] Data may not add to totals because of rounding.

[2] Includes sulfate dissolving pulp beginning in 1955.

[3] Includes dissolving and special alpha pulps for some years prior to 1937.

[4] Includes sulfate dissolving pulp prior to 1955.

[5] Includes imports of semichemical, defibrated or exploded, screenings, etc.

[6] Includes sulfate dissolving pulp beginning in 1952.

[7] Includes dissolving and special alpha pulps for some years prior to 1939.

[8] Includes sulfate dissolving pulp prior to 1952.

[9] Type data for the years 1954–65 estimated from Census combined data by the United States Pulp Producers Association, Inc.

[10] Includes exports of groundwood, semicbemical, defibrated or exploded, screenings, etc.

[11] Less tban 500 tons.

[12] Preliminary.

NOTE: Data prior to 1940 may not add to totals because of the inclusion in the totals of wood pulp not shown separately by type.

Sources: See source note table 1.

TABLE 12.—*Imports of wood pulp into the United States, by type and major region of origin, 1964* [1]
[*Thousand tons*]

| Region | Total | Dissolving and special alpha | Sulfite | Sulfate | Soda | Groundwood | All other |
|---|---|---|---|---|---|---|---|
| Canada | 2,702 | 262 | 645 | 1,419 | 28 | 342 | 5 |
| Latin America | (2) | -- | -- | (2) | -- | (2) | -- |
| Western Europe | 230 | 1 | 54 | 164 | -- | 5 | 4 |
| Eastern Europe | (2) | -- | -- | (2) | -- | -- | -- |
| Africa | 10 | 10 | (2) | (2) | -- | -- | (2) |
| Near and Middle East | (2) | -- | -- | -- | (2) | -- | -- |
| Far East | (2) | -- | -- | (2) | -- | -- | (2) |
| Oceania | -- | -- | -- | -- | -- | -- | -- |
| Total | 2,942 | 274 | 699 | 1,584 | 28 | 348 | 9 |

[1] Data may not add to totals because of rounding.

[2] Less than 500 tons.

NOTE: Regions are as follows: *Latin America*: Argentina, Bahamas, Bermuda, Bolivia, Brazil, British Guiana, British Honduras, British West Indies, Canal Zone, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Falkland Islands, French Guiana, French West Indies, Guatemala, Haiti, Honduras, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Surinam, Trinidad and Tobago, Uruguay, Venezuela. *Western Europe*: Austria, Azores, Belgium, Cyprus, Denmark, Finland, France, Gibraltar, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, West Germany. *Eastern Europe*: Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R., Yugoslavia. *Africa*: Algeria, Angola and Cabinda, Basutoland, Bechuanaland, Burundi, Cameroon, Canary Islands, Central African Republic, Chad, Congo (Brazzaville), Congo (Leopoldville), Dahomey, Ethiopia, French Somaliland, Gabon, Gambia, Ghana, Guinea, Ivory Coast, Kenya, Liberia, Libya, Madeira Islands, Malagasy Republic, Malawi, Mauritius and Dependencies, Morocco, Mozambique, Niger, Nigeria, Portuguese Guinea, Republic of South Africa, Rhodesia, Rwanda, Senegal, Seychelles and Dependencies, Sierra Leone, Somali Republic, Spanish Africa, Sudan, Swaziland, Tanganyika and Zanzibar, Togo, Tunisia, Uganda, United Arab Republic, Upper Volta, Zambia. *Near and Middle East*: Bahrain, Federation of South Arabia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Saudi Arabia, Syrian Arab Republic, Turkey, Yemen. *Far East*: Afghanistan, Brunei, Burma, Cambodia, Ceylon, China Mainland, Hong Kong, India, Indonesia, Japan, Laos, Macao and Timor, Malaysia, Nepal, North Korea, North Vietnam, Outer Mongolia, Pakistan, Philippines, Republic of Korea, Republic of Vietnam, Taiwan, Thailand. *Oceania*: Australia, Fiji, New Zealand. Country designations based on information published by the U.S. Department of Commerce, Bureau of the Census in *Schedule C.—Classification of country designations used in compiling the United States foreign trade statistics.* January 1, 1965 ed.

Source: United States Pulp Producers Association Inc., op. cit.

TABLE 13.—*Exports of wood pulp from the United States, by type and major region of destination, 1964* [1]
[Thousand tons]

| Region | Total | Dissolving and special alpha | Sulfite | Sulfate | All other |
|---|---|---|---|---|---|
| Canada | 62 | 13 | 39 | 10 | 1 |
| Latin America | 205 | 56 | 35 | 114 | (2) |
| Western Europe | 719 | 248 | 71 | 400 | (2) |
| Eastern Europe | 15 | 12 | 3 | (2) | -- |
| Africa | 22 | 4 | (2) | 17 | -- |
| Near and Middle East | 8 | (2) | 3 | 4 | -- |
| Far East | 517 | 239 | 106 | 171 | 1 |
| Oceania | 32 | 10 | 15 | 7 | -- |
| Total | 1,580 | 581 | 272 | 725 | 2 |

[1] Data may not add to totals because of rounding.

[2] Less than 500 tons.

NOTE: See table 12 for definition of regions.

Source: United States Pulp Producers Association, Inc., op. cit.

# APPENDIX F

## Use of Fibrous Materials (Including Wood Pulp by Type) in the Manufacture of the Major Grades of Paper and Board

[Note: Includes graphs showing historical trends in the use of fibrous materials and wood pulp per ton of paper and board manufactured, with extrapolations to 1985.]

### Appendix F Contents

TABLE 1.—*Fibrous materials consumed in the manufacture of paper and board in the United States, by type of material, specified years 1919–65* [1]

| Year | Consumption of fibrous materials | | | | Consumption of fibrous materials per ton of paper and board produced | | | |
|---|---|---|---|---|---|---|---|---|
| | Total | Wood pulp | Waste paper | Other | Total | Wood pulp | Waste paper | Other |
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand Tons* | *Tons* | *Tons* | *Tons* | *Tons* |
| 1919 | 6,622 | 4,020 | 1,854 | 748 | 1.110 | 0.674 | 0.311 | 0.125 |
| 1929 | 11,575 | 6,289 | 3,842 | 1,443 | 1.039 | .565 | .345 | .129 |
| 1935 | 10,999 | 6,442 | 3,587 | 969 | 1.050 | .615 | .342 | .092 |
| 1939 | 14,177 | 8,650 | 4,366 | 1,161 | 1.049 | .640 | .323 | .086 |
| 1940 | 15,493 | 9,782 | 4,668 | 1,044 | 1.070 | .675 | .322 | .072 |
| 1941 | 18,856 | 11,364 | 6,075 | 1,418 | 1.062 | .640 | .342 | .080 |
| 1942 | 17,858 | 11,038 | 5,495 | 1,325 | 1.045 | .646 | .322 | .078 |
| 1943 | 18,199 | 10,635 | 6,368 | 1,196 | 1.068 | .624 | .374 | .070 |
| 1944 | 18,747 | 10,502 | 6,859 | 1,385 | 1.091 | .611 | .399 | .081 |
| 1945 | 18,969 | 10,825 | 6,800 | 1,344 | 1.092 | .623 | .391 | .077 |
| 1946 | 20,752 | 12,092 | 7,278 | 1,382 | 1.077 | .627 | .378 | .072 |
| 1947 | 22,788 | 13,253 | 8,009 | 1,526 | 1.079 | .628 | .379 | .072 |
| 1948 | 23,411 | 14,375 | 7,585 | 1,452 | 1.069 | .657 | .346 | .066 |
| 1949 | 21,451 | 13,636 | 6,600 | 1,215 | 1.056 | .671 | .325 | .060 |
| 1950 | 25,904 | 16,509 | 7,956 | 1,439 | 1.062 | .677 | .326 | .059 |
| 1951 | 28,265 | 17,737 | 9,071 | 1,457 | 1.085 | .681 | .348 | .056 |
| 1952 | 26,378 | 17,286 | 7,881 | 1,211 | 1.080 | .708 | .323 | .050 |
| 1953 | 28,469 | 18,684 | 8,531 | 1,255 | 1.072 | .703 | .321 | .047 |
| 1954 | 28,045 | 18,989 | 7,857 | 1,200 | 1.044 | .707 | .292 | .045 |
| 1955 | 31,835 | 21,454 | 9,041 | 1,340 | 1.056 | .711 | .300 | .045 |
| 1956 | 33,386 | 22,998 | 8,836 | 1,551 | 1.052 | .730 | .282 | .040 |
| 1957 | 32,058 | 22,459 | 8,493 | 1,105 | 1.045 | .732 | .277 | .036 |
| 1958 | 32,157 | 22,483 | 8,671 | 1,003 | 1.043 | .729 | .281 | .033 |
| 1959 | 35,549 | 25,155 | 9,414 | 979 | 1.045 | .740 | .277 | .028 |
| 1960 | 35,703 | 25,700 | 9,032 | 971 | 1.036 | .746 | .262 | .028 |
| 1961 | 36,595 | 26,683 | 9,018 | 894 | 1.025 | .747 | .253 | .025 |
| 1962 | 38,636 | 28,598 | 9,075 | 963 | 1.029 | .762 | .242 | .025 |
| 1963 | 41,117 | 30,220 | 9,613 | 1,285 | 1.048 | .770 | .245 | .033 |
| 1964 | 42,478 | 32,031 | 9,493 | 954 | 1.018 | .767 | .227 | .023 |
| 1965 [2] | 45,089 | 34,156 | 9,923 | 1,010 | 1.031 | .781 | .227 | .023 |

[1] Data may not add to totals because of rounding.

[2] Preliminary.

Sources: United States Pulp Producers Association, Inc. *Wood pulp statistics.* New York, 1966. Annual; U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board.* Cur. Indus. Rpts. Ser. M26A. Annual; and U.S. Department of Agriculture, Forest Service.

TABLE 2.—*Wood pulp consumed in the manufacture of paper and board in the United States, by type of pulp, specified years 1919–64* [1]

| Year | Consumption of wood pulp | | | | | | | Consumption of wood pulp per ton of paper and board produced | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Sulfite[2] | Sulfate | Soda | Ground-wood | Semi-chemical | Other[3] | Total | Sulfite[2] | Sulfate | Soda | Ground-wood | Semi-chemical | Other[3] |
| | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Thousand tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* |
| 1919 | 4,020 | 1,617 | 266 | 396 | 1,675 | -- | -- | 0.674 | 0.271 | 0.045 | 0.066 | 0.281 | -- | -- |
| 1929 | 6,289 | 2,551 | 1,312 | 520 | 1,865 | -- | -- | .565 | .229 | .118 | .047 | .167 | -- | -- |
| 1935 | 6,442 | 2,368 | 1,976 | -- | 1,537 | -- | -- | .615 | .226 | .189 | -- | .147 | -- | -- |
| 1939 | 8,650 | 2,913 | 3,354 | -- | 1,749 | -- | -- | .640 | .216 | .248 | -- | .129 | -- | -- |
| 1940 | 9,782 | 2,907 | 3,965 | 532 | 2,139 | -- | -- | .675 | .201 | .274 | .037 | .148 | -- | -- |
| 1941 | 11,364 | 3,348 | 4,614 | 515 | 2,317 | -- | -- | .640 | .188 | .260 | .029 | .130 | -- | -- |
| 1942 | 11,038 | 3,079 | 4,633 | 469 | 2,040 | -- | -- | .646 | .180 | .271 | .027 | .119 | -- | -- |
| 1943 | 10,635 | 2,892 | 4,430 | 456 | 1,987 | -- | -- | .624 | .170 | .260 | .027 | .117 | -- | -- |
| 1944 | 10,502 | 2,519 | 4,588 | 418 | 1,961 | -- | -- | .611 | .147 | .267 | .024 | .114 | -- | -- |
| 1945 | 10,825 | 2,583 | 4,680 | 440 | 2,035 | -- | -- | .623 | .149 | .269 | .025 | .117 | -- | -- |
| 1946 | 12,092 | 3,144 | 5,141 | 492 | 2,188 | -- | -- | .627 | .163 | .267 | .026 | .113 | -- | -- |
| 1947 | 13,253 | 3,229 | 5,860 | 520 | 2,329 | -- | -- | .628 | .153 | .278 | .025 | .110 | -- | -- |
| 1948 | 14,375 | 3,333 | 6,663 | 521 | 2,482 | 485 | 890 | .657 | .152 | .304 | .024 | .113 | 0.022 | 0.041 |
| 1949 | 13,636 | 2,986 | 6,678 | 526 | 2,184 | 502 | 760 | .671 | .147 | .329 | .026 | .108 | .025 | .037 |
| 1950 | 16,509 | 3,276 | 8,381 | 559 | 2,483 | 685 | 1,124 | .677 | .134 | .344 | .023 | .102 | .028 | .046 |
| 1951 | 17,737 | 3,240 | 9,309 | 484 | 2,752 | 804 | 1,148 | .681 | .124 | .357 | .019 | .106 | .031 | .044 |
| 1952 | 17,286 | 2,971 | 9,136 | 461 | 2,552 | 828 | 1,338 | .708 | .122 | .374 | .019 | .105 | .034 | .055 |
| 1953 | 18,684 | 3,012 | 10,293 | 485 | 2,528 | 1,022 | 1,342 | .703 | .113 | .387 | .018 | .095 | .038 | .050 |
| 1954 | 18,989 | 2,953 | 10,510 | 466 | 2,710 | 1,138 | 1,212 | .707 | .110 | .391 | .017 | .101 | .042 | .045 |
| 1955 | 21,454 | 3,229 | 11,998 | 491 | 2,935 | 1,407 | 1,394 | .711 | .107 | .398 | .016 | .097 | .047 | .046 |
| 1956 | 22,998 | 3,397 | 12,881 | 530 | 3,231 | 1,571 | 1,389 | .730 | .108 | .410 | .017 | .103 | .050 | .044 |
| 1957 | 22,459 | 3,170 | 12,768 | 480 | 3,215 | 1,576 | 1,251 | .732 | .103 | .416 | .016 | .105 | .051 | .041 |
| 1958 | 22,483 | 2,982 | 13,110 | 470 | 3,056 | 1,530 | 1,335 | .729 | .097 | .425 | .015 | .099 | .050 | .043 |
| 1959 | 25,155 | 3,025 | 14,874 | 519 | 3,370 | 1,924 | 1,443 | .740 | .089 | .437 | .015 | .099 | .057 | .042 |
| 1960 | 25,700 | 3,111 | 15,336 | 458 | 3,430 | 1,994 | 1,371 | .746 | .090 | .445 | .013 | .100 | .058 | .040 |
| 1961 | 26,683 | 3,050 | 16,098 | 450 | 3,331 | 2,350 | 1,404 | .747 | .085 | .451 | .013 | .093 | .066 | .039 |
| 1962 | 28,598 | 3,152 | 17,357 | 464 | 3,548 | 2,517 | 1,561 | .762 | .084 | .462 | .012 | .095 | .067 | .042 |
| 1963 | 30,220 | 3,139 | 18,700 | 413 | 3,590 | 2,681 | 1,697 | .770 | .080 | .477 | .011 | .092 | .068 | .043 |
| 1964 [4] | 32,031 | 3,155 | 20,392 | 432 | 3,691 | 2,689 | 1,672 | .767 | .076 | .488 | .010 | .088 | .064 | .040 |

[1] Data may not add to totals because of rounding.

[2] Includes dissolving pulp for the years 1919–48.

[3] Includes small quantities of dissolving and special alpha pulps beginning in 1949.

[4] Preliminary.

NOTE: Data prior to 1948 may not add to totals because of the inclusion in the totals of wood pulps not shown separately by type.

Sources: 1919–62, derived from data published by the United States Pulp Producers Association, Inc., op. cit.; 1963–64, derived from data published by the U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board.*

TABLE 3.—*Fibrous materials consumed in the manufacture of paper and board in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 2,594 | 3,229 | 3,092 | 3,214 | 3,139 |
| Sulfate | 4,528 | 5,860 | 10,429 | 13,120 | 18,700 |
| Groundwood | 1,746 | 2,361 | 2,710 | 3,233 | 3,590 |
| Semichemical | -- | -- | 1,138 | 1,194 | 2,681 |
| Other | 1,572 | 1,835 | 1,619 | 1,772 | 2,109 |
| Total | 10,440 | 13,285 | 18,989 | 22,533 | 30,220 |
| Other fibrous materials: | | | | | |
| Waste paper | 6,590 | 8,009 | 7,857 | 8,666 | 9,551 |
| Other | 1,448 | 1,493 | 1,200 | 1,142 | 1,285 |
| Total | 8,038 | 9,502 | 9,056 | 9,808 | 10,836 |
| Total | 18,478 | 22,788 | 28,045 | 32,342 | 41,056 |
| PRODUCTION OF PAPER AND BOARD [THOUSAND TONS] | | | | | |
| Total | 17,327 | 21,114 | 26,876 | 30,707 | 39,231 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF PAPER AND BOARD PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.15 | 0.15 | 0.12 | 0.10 | 0.08 |
| Sulfate | .26 | .28 | .39 | .43 | .48 |
| Groundwood | .10 | .11 | .10 | .11 | .09 |
| Semichemical | -- | -- | .04 | .04 | .07 |
| Other | .09 | .09 | .06 | .06 | .05 |
| Total | .60 | .63 | .71 | .73 | .77 |
| Other fibrous materials: | | | | | |
| Waste paper | .38 | .38 | .29 | .28 | .24 |
| Other | .08 | .07 | .04 | .04 | .03 |
| Total | .46 | .45 | .34 | .32 | .28 |
| Total | 1.07 | 1.08 | 1.04 | 1.05 | 1.05 |

[1] Data may not add to totals because of rounding.

[2] October 1, 1943 to September 30, 1944.

Sources: War Production Board, Forest Products Bureau. Memorandum WPBI 2622. Washington: unpublished, 1944.

U.S. Department of Commerce, Bureau of the Census. *Census of manufactures: 1947; 1954; 1958.* MC–26A, and *Pulp, paper and board.* 1963.

TABLE 4.—*Fibrous materials consumed in the manufacture of paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 2,362 | 2,988 | 2,815 | 2,976 | -- |
| Sulfate | 2,304 | 3,259 | 5,284 | 6,280 | -- |
| Groundwood | 1,414 | 1,734 | 2,090 | 2,661 | 2,935 |
| Semichemical | -- | -- | 123 | 165 | -- |
| Other | 620 | 875 | 878 | 776 | -- |
| Total | 6,699 | 8,856 | 11,189 | 12,857 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 1,158 | 1,627 | 1,584 | 1,985 | 2,191 |
| Other | 664 | 719 | 495 | 513 | -- |
| Total | 1,822 | 2,346 | 2,078 | 2,498 | -- |
| Total | 8,522 | 11,201 | 13,267 | 15,355 | 19,426 |
| PRODUCTION OF PAPER [THOUSAND TONS] | | | | | |
| Total | 8,421 | 10,705 | 13,077 | 14,963 | 18,752 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.28 | 0.28 | 0.22 | 0.20 | -- |
| Sulfate | .27 | .30 | .40 | .42 | -- |
| Groundwood | .17 | .16 | .16 | .18 | 0.16 |
| Semichemical | -- | -- | .01 | .01 | -- |
| Other | .07 | .08 | .07 | .05 | -- |
| Total | .80 | .83 | .86 | .86 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .14 | .15 | .12 | .13 | .12 |
| Other | .08 | .07 | .04 | .03 | -- |
| Total | .22 | .22 | .16 | .17 | -- |
| Total | 1.01 | 1.05 | 1.01 | 1.03 | 1.04 |

[1] Data may not add to totals because of rounding.

[2] October 1, 1943 to September 30, 1944.

Sources: See source note table 3.

TABLE 5.—*Fibrous materials consumed in the manufacture of newsprint in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 96 | -- | 130 | 243 | -- |
| Sulfate | 10 | -- | 111 | 208 | -- |
| Groundwood | 660 | -- | 1,054 | 1,461 | 1,564 |
| Semichemical | -- | -- | -- | 5 | -- |
| Other | -- | -- | -- | | -- |
| Total | 765 | -- | 1,295 | 1,918 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 1 | -- | -- | -- | 31 |
| Other | -- | -- | -- | -- | -- |
| Total | 1 | -- | 6 | 8 | -- |
| Total | 767 | -- | 1,301 | 1,925 | 2,252 |
| PRODUCTION OF NEWSPRINT [THOUSAND TONS] | | | | | |
| Total | 731 | 833 | 1,202 | 1,731 | 2,213 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF NEWSPRINT PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.13 | -- | 0.11 | 0.14 | -- |
| Sulfate | .01 | -- | .09 | .12 | -- |
| Groundwood | .90 | -- | .88 | .84 | 0.71 |
| Semichemical | -- | -- | -- | (3) | -- |
| Other | -- | -- | -- | | -- |
| Total | 1.05 | -- | 1.08 | 1.11 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | (3) | -- | -- | -- | -- |
| Other | -- | -- | -- | -- | -- |
| Total | (3) | -- | (3) | (3) | .01 |
| Total | 1.05 | -- | 1.08 | 1.11 | 1.02 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 6.—*Fibrous materials consumed in the manufacture of groundwood paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 177 | -- | 209 | 187 | 176 |
| Sulfate | 1 | -- | 52 | 62 | -- |
| Groundwood | 375 | -- | 501 | 559 | 636 |
| Semichemical | -- | -- | -- | 15 | -- |
| Other | 1 | -- | -- | -- | -- |
| Total | 553 | -- | 763 | 823 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 41 | -- | 37 | 47 | 44 |
| Other | 2 | -- | -- | -- | -- |
| Total | 44 | -- | 37 | 47 | -- |
| Total | 597 | -- | 800 | 870 | 966 |
| PRODUCTION OF GROUNDWOOD PAPER [THOUSAND TONS] | | | | | |
| Total | 607 | 821 | 788 | 806 | 956 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF GROUNDWOOD PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.29 | -- | 0.27 | 0.23 | 0.18 |
| Sulfate | (3) | -- | .07 | .08 | -- |
| Groundwood | .62 | -- | .64 | .69 | .67 |
| Semichemical | -- | -- | -- | .02 | -- |
| Other | (3) | -- | -- | -- | -- |
| Total | .91 | -- | .97 | 1.02 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .07 | -- | .05 | .06 | .05 |
| Other | (3) | -- | -- | -- | -- |
| Total | .07 | -- | .05 | .06 | -- |
| Total | .98 | -- | 1.02 | 1.08 | 1.01 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 7.—*Fibrous materials consumed in the manufacture of book paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 382 | -- | 678 | 722 | 587 |
| Sulfate | 212 | -- | 837 | 931 | 1,913 |
| Groundwood | 95 | -- | 268 | 336 | 464 |
| Semichemical | -- | -- | 57 | 47 | 89 |
| Other | 281 | -- | 309 | 319 | -- |
| Total | 970 | -- | 2,148 | 2,355 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 358 | -- | 419 | 481 | 462 |
| Other | 2 | -- | 18 | 29 | -- |
| Total | 359 | -- | 437 | 510 | -- |
| Total | 1,329 | -- | 2,585 | 2,865 | 3,780 |
| PRODUCTION OF BOOK PAPER [THOUSAND TONS] | | | | | |
| Total | 1,568 | 2,208 | 2,799 | 3,245 | 4,288 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF BOOK PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.24 | -- | 0.24 | 0.22 | 0.14 |
| Sulfate | .14 | -- | .30 | .29 | .45 |
| Groundwood | .06 | -- | .10 | .10 | .11 |
| Semichemical | -- | -- | .02 | .01 | .02 |
| Other | .18 | -- | .11 | .10 | -- |
| Total | .62 | -- | .77 | .73 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .23 | -- | .15 | .15 | .11 |
| Other | [3] | -- | .01 | .01 | -- |
| Total | .23 | -- | .16 | .16 | -- |
| Total | .85 | -- | .92 | .88 | .88 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 8.—*Fibrous materials consumed in the manufacture of fine paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sufite | 535 | -- | 549 | 597 | 561 |
| Sulfate | 129 | -- | 490 | 580 | 955 |
| Groundwood | 7 | -- | 3 | 6 | 11 |
| Semichemical | -- | -- | 17 | 55 | 134 |
| Other | 89 | -- | 109 | 122 | 157 |
| Total | 759 | -- | 1,169 | 1,361 | 1,817 |
| Other fibrous materials: | | | | | |
| Waste paper | 111 | -- | 60 | 103 | 101 |
| Other | 150 | -- | 125 | 133 | 196 |
| Total | 261 | -- | 186 | 236 | 297 |
| Total | 1,020 | -- | 1,355 | 1,597 | 2,114 |
| PRODUCTION OF FINE PAPER [THOUSAND TONS] | | | | | |
| Total | 1,023 | 1,172 | 1,285 | 1,556 | 2,104 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF FINE PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.52 | -- | 0.43 | 0.38 | 0.27 |
| Sulfate | .13 | -- | .38 | .37 | .45 |
| Groundwood | .01 | -- | [3] | [3] | .01 |
| Semichemical | -- | -- | .01 | .04 | .06 |
| Other | .09 | -- | .08 | .08 | .07 |
| Total | .74 | -- | .91 | .87 | .86 |
| Other fibrous materials: | | | | | |
| Waste paper | .11 | -- | .05 | .07 | .05 |
| Other | .15 | -- | .10 | .09 | .09 |
| Total | .26 | -- | .14 | .15 | .14 |
| Total | 1.00 | -- | 1.05 | 1.03 | 1.00 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 9.—*Fibrous materials consumed in the manufacture of coarse and industrial paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44 [2] | 1947 [3] | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 568 | 551 | 453 | 409 | 303 |
| Sulfate | 1,872 | 2,545 | 3,350 | 3,749 | 4,789 |
| Groundwood | 55 | 46 | 15 | 16 | 13 |
| Semichemical | -- | -- | 11 | 13 | -- |
| Other | 62 | 59 | 74 | 79 | -- |
| Total | 2,557 | 3,201 | 3,903 | 4,267 | 5,212 |
| Other fibrous materials: | | | | | |
| Waste paper | 139 | 176 | -- | -- | 296 |
| Other | 64 | 35 | -- | -- | 241 |
| Total | 204 | 211 | 177 | 314 | 537 |
| Total | 2,761 | 3,413 | 4,079 | 4,581 | 5,749 |
| PRODUCTION OF COARSE AND INDUSTRIAL PAPER [THOUSAND TONS] | | | | | |
| Total | 2,637 | 3,193 | 3,962 | 4,285 | 5,162 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF COARSE AND INDUSTRIAL PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.22 | 0.17 | 0.11 | 0.10 | 0.06 |
| Sulfate | .71 | .80 | .85 | .87 | .93 |
| Groundwood | .02 | .01 | (4) | (4) | (4) |
| Semichemical | -- | -- | (4) | (4) | -- |
| Other | .02 | .02 | .02 | .02 | -- |
| Total | .97 | 1.00 | .99 | 1.00 | 1.01 |
| Other fibrous materials: | | | | | |
| Waste paper | .05 | .06 | -- | -- | .06 |
| Other | .02 | .01 | -- | -- | .05 |
| Total | .08 | .07 | .04 | .07 | .10 |
| Total | 1.05 | 1.07 | 1.03 | 1.07 | 1.11 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Excludes absorbent paper.
[4] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 10.—*Fibrous materials consumed in the manufacture of sanitary and tissue paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44 [2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 604 | 673 | 780 | 813 | 1,112 |
| Sulfate | 78 | 132 | 443 | 680 | 924 |
| Groundwood | 222 | 212 | 212 | 265 | 216 |
| Semichemical | -- | -- | -- | -- | -- |
| Other | 24 | 7 | 17 | 14 | 54 |
| Total | 929 | 1,024 | 1,452 | 1,773 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 117 | 157 | 252 | -- | 465 |
| Other | 1 | 1 | 5 | -- | -- |
| Total | 118 | 157 | 257 | 299 | -- |
| Total | 1,047 | 1,182 | 1,709 | 2,072 | 2,909 |
| PRODUCTION OF SANITARY AND TISSUE PAPER [THOUSAND TONS] | | | | | |
| Total | 973 | 1,089 | 1,612 | 1,925 | 2,576 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF SANITARY AND TISSUE PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.62 | 0.62 | 0.48 | 0.42 | 0.43 |
| Sulfate | .08 | .12 | .27 | .35 | .36 |
| Groundwood | .23 | .19 | .13 | .14 | .08 |
| Semichemical | -- | -- | -- | -- | -- |
| Other | .02 | .01 | .01 | .01 | .02 |
| Total | .95 | .94 | .90 | .92 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .12 | .14 | .16 | -- | .18 |
| Other | (3) | (3) | (3) | -- | -- |
| Total | .12 | .14 | .16 | .16 | -- |
| Total | 1.08 | 1.09 | 1.06 | 1.08 | 1.13 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 11.—*Fibrous materials consumed in the manufacture of construction paper in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 2 | 1 | 15 | 4 | -- |
| Sulfate | 2 | 6 | 1 | 70 | -- |
| Groundwood | -- | 46 | 37 | 16 | 32 |
| Semichemical | -- | -- | 38 | 30 | -- |
| Other | 162 | 311 | 368 | 241 | 448 |
| Total | 166 | 365 | 458 | 361 | 517 |
| Other fibrous materials: | | | | | |
| Waste paper | 391 | 616 | 684 | 780 | 793 |
| Other | 445 | 459 | 295 | 303 | 346 |
| Total | 836 | 1,075 | 979 | 1,084 | 1,139 |
| Total | 1,002 | 1,440 | 1,437 | 1,444 | 1,655 |
| PRODUCTION OF CONSTRUCTION PAPER [THOUSAND TONS] | | | | | |
| Total | 882 | 1,289 | 1,428 | 1,415 | 1,453 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF CONSTRUCTION PAPER PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | (3) | (3) | 0.01 | (3) | -- |
| Sulfate | (3) | (3) | (3) | 0.05 | -- |
| Groundwood | -- | 0.04 | .03 | .01 | 0.02 |
| Semichemical | -- | -- | .03 | .02 | -- |
| Other | 0.18 | .24 | .26 | .17 | .31 |
| Total | .19 | .28 | .32 | .26 | .36 |
| Other fibrous materials: | | | | | |
| Waste paper | .44 | .48 | .48 | .55 | .55 |
| Other | .50 | .36 | .21 | .21 | .24 |
| Total | .95 | .83 | .69 | .77 | .78 |
| Total | 1.14 | 1.12 | 1.01 | 1.02 | 1.14 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 12.—*Fibrous materials consumed in the manufacture of board in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 232 | 241 | 278 | 239 | -- |
| Sulfate | 2,223 | 2,601 | 5,146 | 6,840 | -- |
| Groundwood | 333 | 628 | 621 | 572 | 654 |
| Semichemical | -- | -- | 1,015 | 1,029 | -- |
| Other | 952 | 960 | 742 | 997 | -- |
| Total | 3,741 | 4,430 | 7,801 | 9,677 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 5,432 | 6,382 | 6,273 | 6,681 | 7,360 |
| Other | 783 | 774 | 705 | 629 | -- |
| Total | 6,215 | 7,156 | 6,978 | 7,310 | -- |
| Total | 9,956 | 11,586 | 14,779 | 16,987 | 21,630 |
| PRODUCTION OF BOARD [THOUSAND TONS] | | | | | |
| Total | 8,906 | 10,409 | 13,799 | 15,741 | 20,478 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF BOARD PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.03 | 0.02 | 0.02 | 0.02 | -- |
| Sulfate | .25 | .25 | .37 | .43 | -- |
| Groundwood | .04 | .06 | .05 | .04 | 0.03 |
| Semichemical | -- | -- | .07 | .07 | -- |
| Other | .11 | .09 | .05 | .06 | -- |
| Total | .42 | .43 | .57 | .61 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .61 | .61 | .45 | .42 | .36 |
| Other | .09 | .07 | .05 | .04 | -- |
| Total | .70 | .69 | .51 | .46 | -- |
| Total | 1.12 | 1.11 | 1.07 | 1.08 | 1.06 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
Sources: See source note table 3.

TABLE 13.—*Fibrous materials consumed in the manufacture of container board in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 5 | 4 | 8 | 17 | 34 |
| Sulfate | 1,929 | 2,236 | 4,078 | 5,160 | 7,085 |
| Groundwood | 90 | 51 | 31 | 3 | 39 |
| Semichemical | -- | -- | 944 | 789 | 1,996 |
| Other | 300 | 453 | 53 | 34 | 88 |
| Total | 2,324 | 2,744 | 5,114 | 6,004 | 9,243 |
| Other fibrous materials: | | | | | |
| Waste paper | 1,894 | 2,320 | 1,522 | 1,809 | 2,198 |
| Other | 519 | 489 | 246 | 149 | 21 |
| Total | 2,412 | 2,809 | 1,768 | 1,958 | 2,219 |
| Total | 4,736 | 5,554 | 6,882 | 7,962 | 11,461 |
| PRODUCTION OF CONTAINER BOARD [THOUSAND TONS] | | | | | |
| Total | 4,188 | 4,944 | 6,488 | 7,441 | 10,425 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF CONTAINER BOARD PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | (3) | (3) | (3) | (3) | (3) |
| Sulfate | 0.46 | 0.45 | 0.63 | 0.69 | 0.68 |
| Groundwood | .02 | .01 | (3) | (3) | (3) |
| Semichemical | -- | -- | .15 | .11 | .19 |
| Other | .07 | .09 | .01 | (3) | .01 |
| Total | .55 | .56 | .79 | .81 | .89 |
| Other fibrous materials: | | | | | |
| Waste paper | .45 | .47 | .23 | .24 | .21 |
| Other | .12 | .10 | .04 | .02 | (3) |
| Total | .58 | .57 | .27 | .26 | .21 |
| Total | 1.13 | 1.12 | 1.06 | 1.07 | 1.10 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 14.—*Fibrous materials consumed in the manufacture of bending board in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 199 | 207 | -- | 200 | 124 |
| Sulfate | 204 | 301 | -- | 1,424 | -- |
| Groundwood | 82 | 116 | -- | 68 | 65 |
| Semichemical | -- | -- | -- | 9 | -- |
| Other | 27 | 25 | -- | 47 | -- |
| Total | 512 | 649 | -- | 1,748 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 1,765 | 2,317 | -- | 2,688 | 3,591 |
| Other | 8 | 12 | -- | 4 | -- |
| Total | 1,773 | 2,329 | -- | 2,692 | -- |
| Total | 2,285 | 2,979 | -- | 4,440 | -- |
| PRODUCTION OF BENDING BOARD [THOUSAND TONS] | | | | | |
| Total | 2,082 | 2,758 | 3,580 | 4,206 | 4,902 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF BENDING BOARD PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.10 | 0.08 | -- | 0.05 | 0.03 |
| Sulfate | .10 | .11 | -- | .34 | -- |
| Groundwood | .04 | .04 | -- | .02 | .01 |
| Semichemical | -- | -- | -- | (3) | -- |
| Other | .01 | .01 | -- | .01 | -- |
| Total | .25 | .24 | -- | .42 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .85 | .84 | -- | .64 | .73 |
| Other | (3) | (3) | -- | (3) | -- |
| Total | .85 | .84 | -- | .64 | -- |
| Total | 1.10 | 1.08 | -- | 1.06 | -- |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 15.—*Fibrous materials consumed in the manufacture of building board in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 6 | -- | -- | -- | -- |
| Sulfate | 2 | -- | -- | -- | -- |
| Groundwood | 115 | 402 | 474 | 443 | 530 |
| Semichemical | -- | -- | 55 | 56 | 246 |
| Other | 595 | 459 | 641 | 846 | 997 |
| Total | 717 | 861 | 1,170 | 1,345 | 1,808 |
| Other fibrous materials: | | | | | |
| Waste paper | 327 | 134 | 142 | 231 | 97 |
| Other | 200 | 218 | 403 | 459 | 267 |
| Total | 526 | 352 | 545 | 690 | 364 |
| Total | 1,243 | 1,213 | 1,716 | 2,035 | 2,172 |
| PRODUCTION OF BUILDING BOARD [THOUSAND TONS] | | | | | |
| Total | 1,136 | 1,072 | 1,473 | 1,682 | 2,098 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF BUILDING BOARD PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.01 | -- | -- | -- | -- |
| Sulfate | (3) | -- | -- | -- | -- |
| Groundwood | .10 | 0.38 | 0.32 | 0.26 | 0.25 |
| Semichemical | -- | -- | .04 | .03 | .12 |
| Other | .52 | .43 | .44 | .50 | .48 |
| Total | .63 | .80 | .79 | .80 | .86 |
| Other fibrous materials: | | | | | |
| Waste paper | .29 | .13 | .10 | .14 | .05 |
| Other | .18 | .20 | .27 | .27 | .13 |
| Total | .46 | .33 | .37 | .41 | .17 |
| Total | 1.09 | 1.13 | 1.16 | 1.21 | 1.04 |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
[3] Less than 0.005 ton.
Sources: See source note table 3.

TABLE 16.—*Fibrous materials consumed in the manufacture of other board in the United States, by type of material, specified years 1943–63* [1]

| Type of material | 1943–44[2] | 1947 | 1954 | 1958 | 1963 |
|---|---|---|---|---|---|
| CONSUMPTION OF FIBROUS MATERIALS [THOUSAND TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 23 | 30 | -- | 21 | -- |
| Sulfate | 88 | 63 | -- | 256 | -- |
| Groundwood | 46 | 58 | -- | 58 | -- |
| Semichemical | -- | -- | -- | 175 | -- |
| Other | 30 | 23 | -- | 70 | -- |
| Total | 187 | 175 | -- | 580 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | 1,447 | 1,611 | -- | 1,952 | 1,474 |
| Other | 57 | 55 | -- | 18 | 33 |
| Total | 1,504 | 1,666 | -- | 1,970 | 1,507 |
| Total | 1,691 | 1,841 | -- | 2,550 | 1,857 |
| PRODUCTION OF OTHER BOARD [THOUSAND TONS] | | | | | |
| Total | 1,500 | 1,635 | 2,259 | 2,412 | 3,053 |
| CONSUMPTION OF FIBROUS MATERIALS PER TON OF OTHER BOARD PRODUCED [TONS] | | | | | |
| Wood pulp: | | | | | |
| Sulfite | 0.02 | 0.02 | -- | 0.01 | -- |
| Sulfate | .06 | .04 | -- | .11 | -- |
| Groundwood | .03 | .04 | -- | .02 | -- |
| Semichemical | -- | -- | -- | .07 | -- |
| Other | .02 | .01 | -- | .03 | -- |
| Total | .12 | .11 | -- | .24 | -- |
| Other fibrous materials: | | | | | |
| Waste paper | .96 | .99 | -- | .81 | 0.48 |
| Other | .04 | .03 | -- | .01 | .01 |
| Total | 1.00 | 1.02 | -- | .82 | .49 |
| Total | 1.13 | 1.13 | -- | 1.06 | -- |

[1] Data may not add to totals because of rounding.
[2] October 1, 1943 to September 30, 1944.
Sources: See source note table 3.

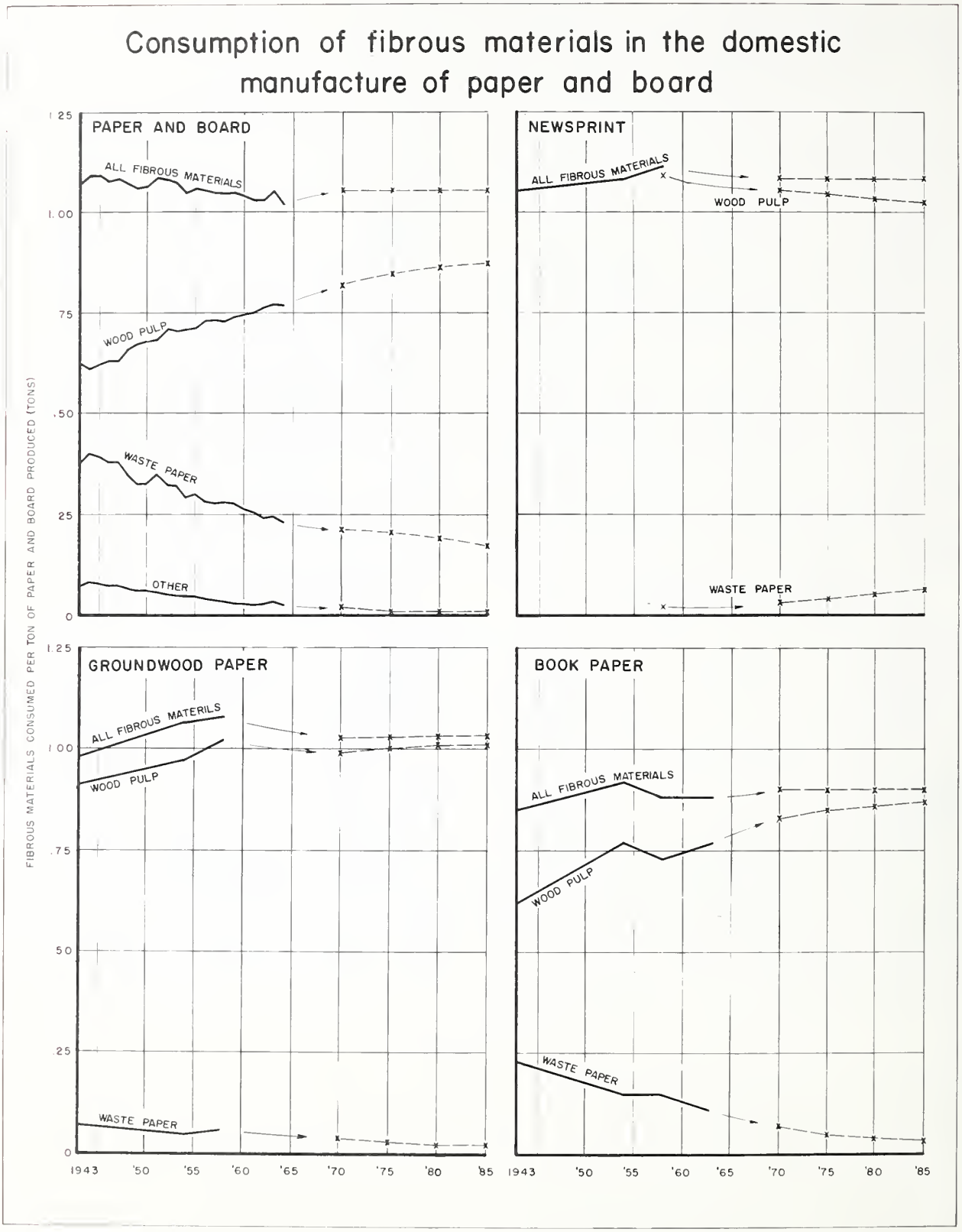
Consumption of fibrous materials in the domestic manufacture of paper and board
FIBROUS MATERIALS CONSUMED PER TON OF PAPER AND BOARD PRODUCED (TONS)
PAPER AND BOARD
ALL FIBROUS MATERIALS
WOOD PULP
WASTE PAPER
OTHER
NEWSPRINT
ALL FIBROUS MATERIALS
WOOD PULP
WASTE PAPER
GROUNDWOOD PAPER
ALL FIBROUS MATERILS
WOOD PULP
WASTE PAPER
BOOK PAPER
ALL FIBROUS MATERIALS
WOOD PULP
WASTE PAPER
1.25
1.00
.75
.50
.25
0
1943
'50
'55
'60
'65
'70
'75
'80
'85

FIGURE 1.

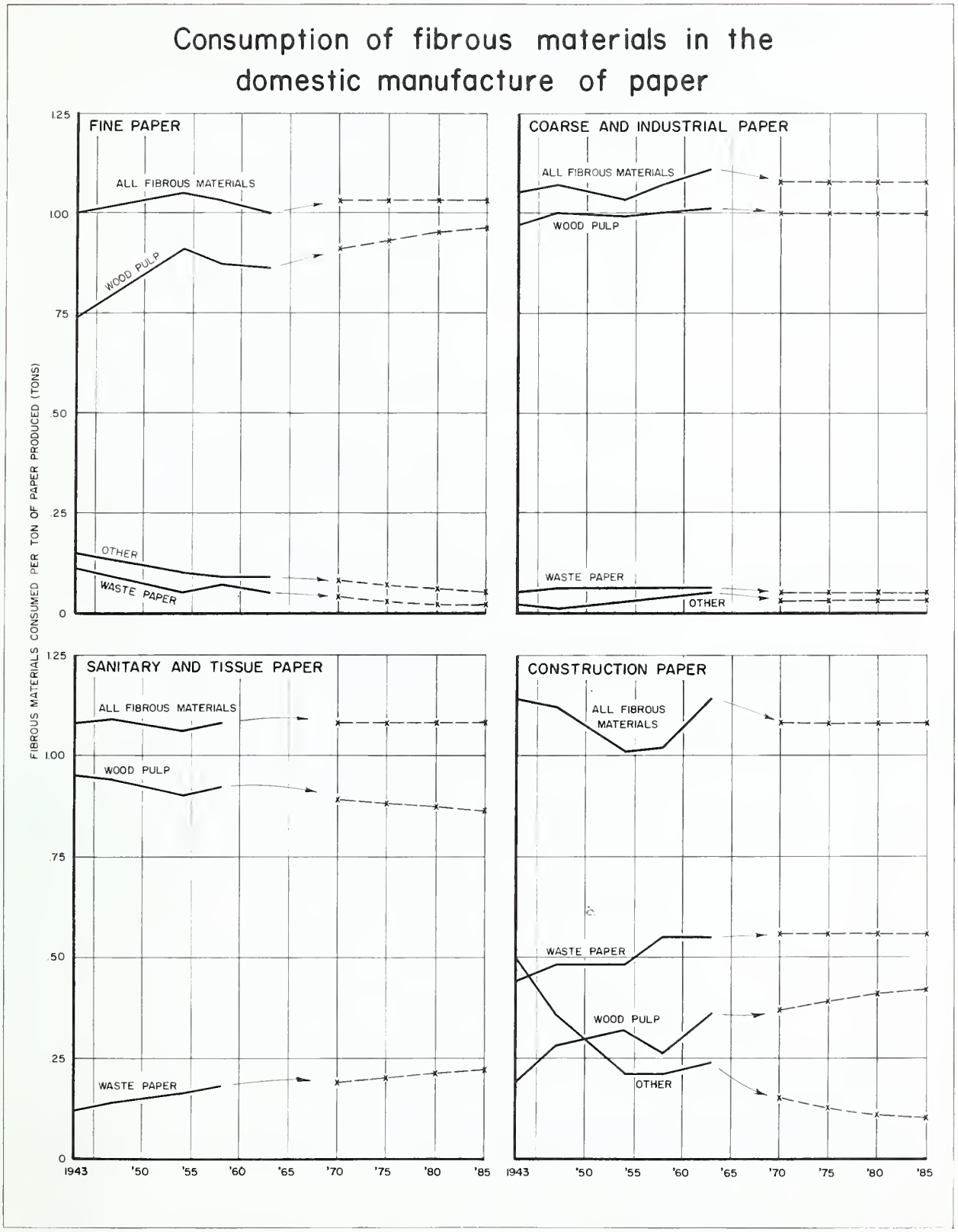
Consumption of fibrous materials in the domestic manufacture of paper
FIBROUS MATERIALS CONSUMED PER TON OF PAPER PRODUCED (TONS)
FINE PAPER
ALL FIBROUS MATERIALS
WOOD PULP
OTHER
WASTE PAPER
COARSE AND INDUSTRIAL PAPER
ALL FIBROUS MATERIALS
WOOD PULP
WASTE PAPER
OTHER
SANITARY AND TISSUE PAPER
ALL FIBROUS MATERIALS
WOOD PULP
WASTE PAPER
CONSTRUCTION PAPER
ALL FIBROUS MATERIALS
WASTE PAPER
WOOD PULP
OTHER
1.25
1.00
.75
.50
.25
0
1943
'50
'55
'60
'65
'70
'75
'80
'85

FIGURE 2.

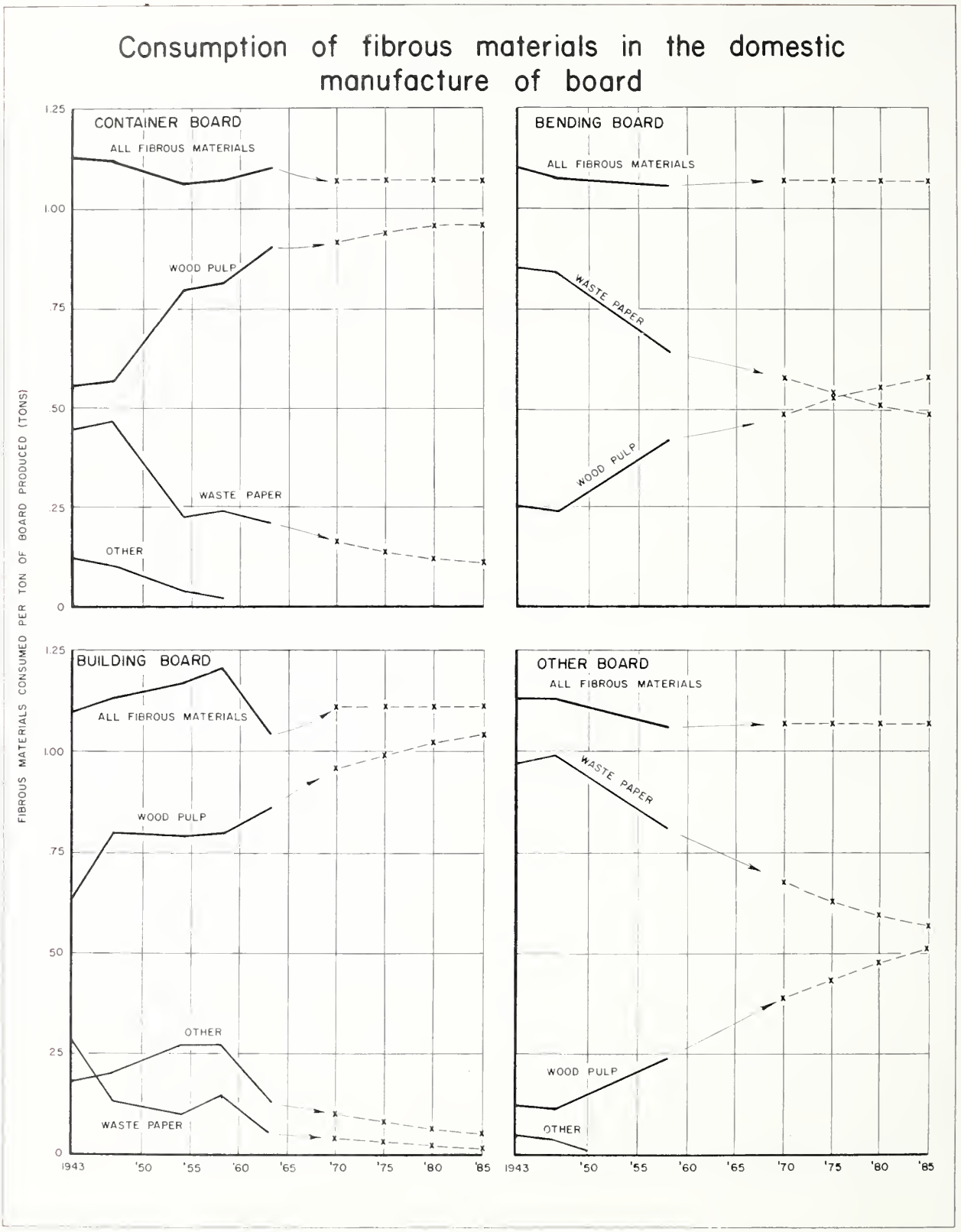
Consumption of fibrous materials in the domestic manufacture of board
FIBROUS MATERIALS CONSUMED PER TON OF BOARD PRODUCED (TONS)
CONTAINER BOARD
ALL FIBROUS MATERIALS
WOOD PULP
WASTE PAPER
OTHER
BENDING BOARD
ALL FIBROUS MATERIALS
WASTE PAPER
WOOD PULP
BUILDING BOARD
ALL FIBROUS MATERIALS
WOOD PULP
OTHER
WASTE PAPER
OTHER BOARD
ALL FIBROUS MATERIALS
WASTE PAPER
WOOD PULP
OTHER
1.25
1.00
.75
.50
.25
0
1943
'50
'55
'60
'65
'70
'75
'80
'85

FIGURE 3.

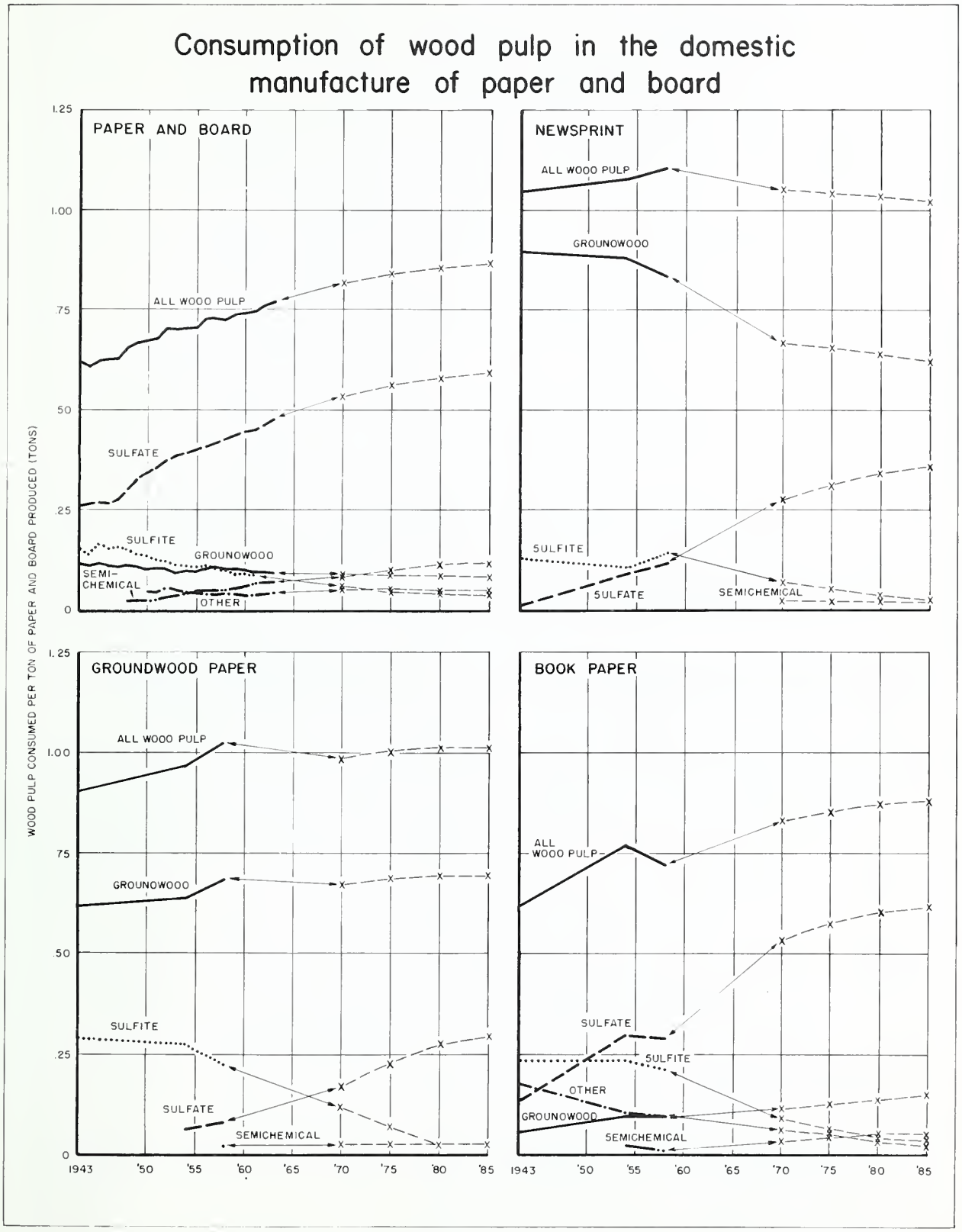
Consumption of wood pulp in the domestic manufacture of paper and board
PAPER AND BOARD
ALL WOOD PULP
SULFATE
SULFITE
GROUNDWOOD
SEMI-CHEMICAL
OTHER
NEWSPRINT
ALL WOOD PULP
GROUNDWOOD
SULFITE
SULFATE
SEMICHEMICAL
GROUNDWOOD PAPER
ALL WOOD PULP
GROUNDWOOD
SULFITE
SULFATE
SEMICHEMICAL
BOOK PAPER
ALL WOOD PULP
SULFATE
SULFITE
OTHER
GROUNDWOOD
SEMICHEMICAL
WOOD PULP CONSUMED PER TON OF PAPER AND BOARD PRODUCED (TONS)
1.25
1.00
.75
.50
.25
0
1943
'50
'55
'60
'65
'70
'75
'80
'85

FIGURE 4.

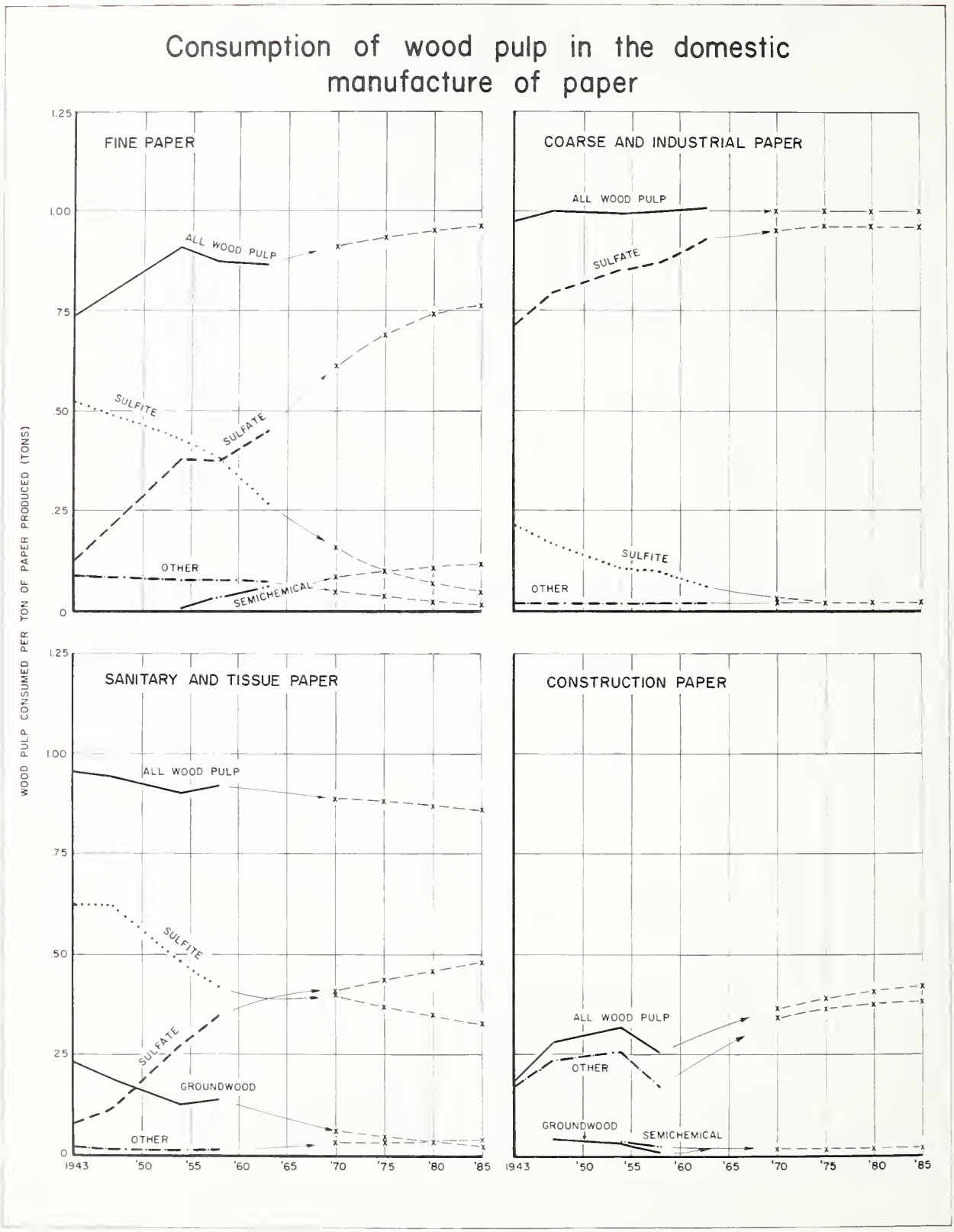
Consumption of wood pulp in the domestic manufacture of paper
WOOD PULP CONSUMED PER TON OF PAPER PRODUCED (TONS)
FINE PAPER
ALL WOOD PULP
SULFITE
SULFATE
OTHER
SEMICHEMICAL
COARSE AND INDUSTRIAL PAPER
ALL WOOD PULP
SULFATE
SULFITE
OTHER
SANITARY AND TISSUE PAPER
ALL WOOD PULP
SULFITE
SULFATE
GROUNDWOOD
OTHER
CONSTRUCTION PAPER
ALL WOOD PULP
OTHER
GROUNDWOOD
SEMICHEMICAL
1.25
1.00
.75
.50
.25
0
1943
'50
'55
'60
'65
'70
'75
'80
'85

FIGURE 5.

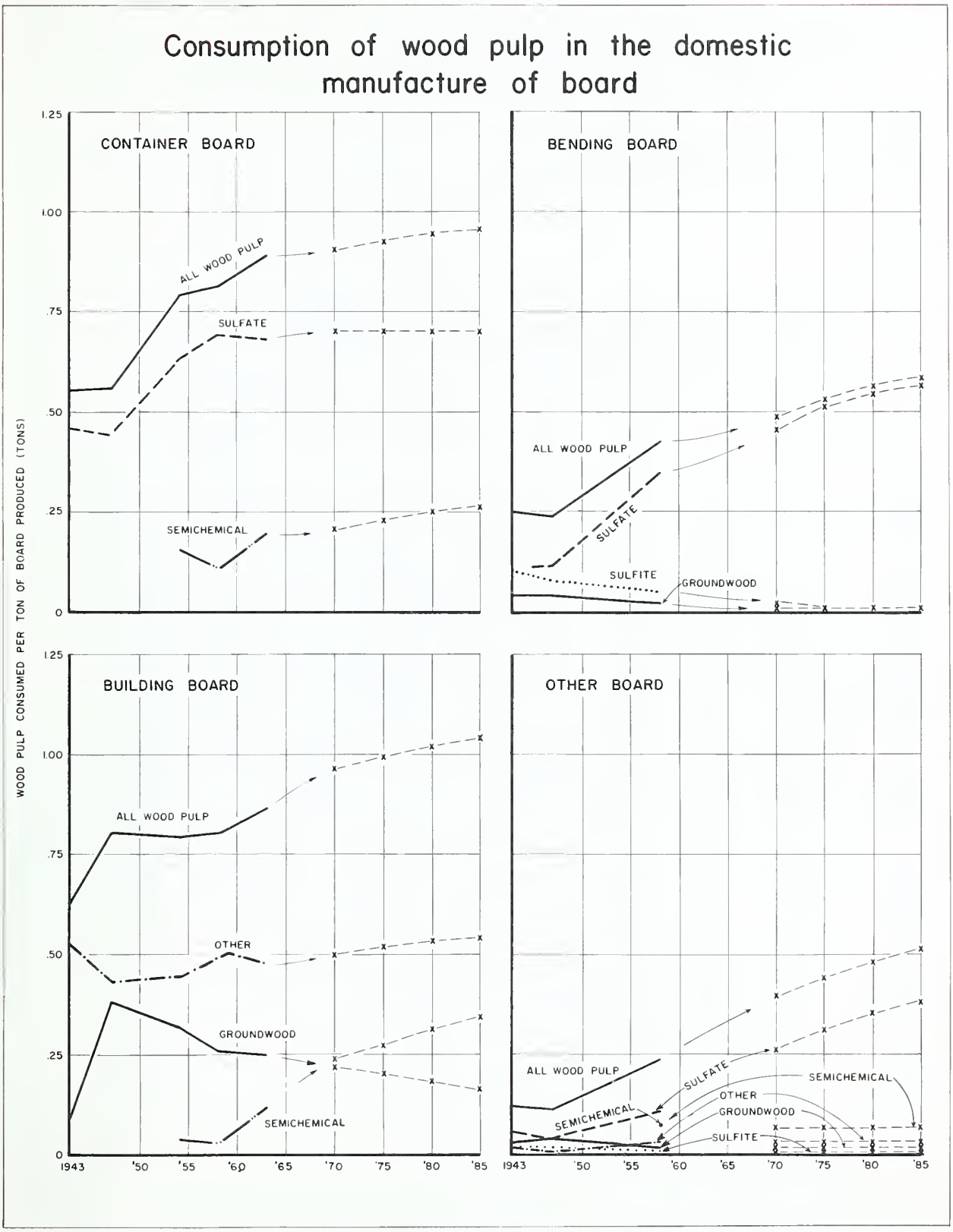
Consumption of wood pulp in the domestic manufacture of board
WOOD PULP CONSUMED PER TON OF BOARD PRODUCED (TONS)
CONTAINER BOARD
ALL WOOD PULP
SULFATE
SEMICHEMICAL
BENDING BOARD
ALL WOOD PULP
SULFATE
SULFITE
GROUNDWOOD
BUILDING BOARD
ALL WOOD PULP
OTHER
GROUNDWOOD
SEMICHEMICAL
OTHER BOARD
ALL WOOD PULP
SULFATE
SEMICHEMICAL
SEMICHEMICAL
OTHER
GROUNDWOOD
SULFITE
0
.25
.50
.75
1.00
1.25
1943
'50
'55
'60
'65
'70
'75
'80
'85

FIGURE 6.

# APPENDIX G

## Production, Trade, and Consumption of Pulpwood

[Note: Includes graphs showing historical trends in the use of pulpwood per ton of wood pulp manufactured, with extrapolations to 1985.]

### Appendix G Contents

TABLE 1.—*Pulpwood consumption, production, net imports, and the equivalent wood volumes of the net imports of paper, board, and wood pulp in the United States, 1920–66* [1]

[Thousand cords]

| Year | Total consumption | Consumption in U.S. mills | | | | | | Net pulpwood imports | Net imports of paper, board, and wood pulp (pulpwood equivalent) |
|---|---|---|---|---|---|---|---|---|---|
| | | Total | U.S. production | | | | Chipped plant by-products | | |
| | | | Total | Roundwood | | | | | |
| | | | | Total | Softwoods | Hardwoods | | | |
| 1920 | 8,240 | 6,114 | 4,873 | 4,703 | 4,157 | 546 | 170 | 1,241 | 2,126 |
| 1921 | 6,621 | 4,557 | 3,476 | 3,409 | 3,068 | 341 | 67 | 1,082 | 2,064 |
| 1922 | 9,022 | 5,549 | 4,537 | 4,449 | 3,955 | 494 | 88 | 1,012 | 3,473 |
| 1923 | 9,957 | 5,873 | 4,539 | 4,435 | 3,947 | 488 | 104 | 1,334 | 4,084 |
| 1924 | 10,194 | 5,768 | 4,517 | 4,398 | 3,875 | 523 | 119 | 1,251 | 4,426 |
| 1925 | 10,778 | 6,094 | 4,624 | 4,468 | 3,963 | 505 | 156 | 1,470 | 4,684 |
| 1926 | 12,106 | 6,766 | 5,403 | 5,222 | 4,679 | 543 | 181 | 1,363 | 5,340 |
| 1927 | 12,206 | 6,751 | 5,213 | 4,927 | 4,351 | 576 | 286 | 1,538 | 5,455 |
| 1928 | 12,928 | 7,160 | 5,641 | 5,185 | 4,620 | 565 | 456 | 1,519 | 5,768 |
| 1929 | 13,898 | 7,645 | 6,347 | 5,786 | 5,080 | 706 | 561 | 1,298 | 6,253 |
| 1930 | 13,188 | 7,196 | 5,744 | 5,148 | 4,479 | 669 | 596 | 1,452 | 5,992 |
| 1931 | 12,075 | 6,723 | 5,782 | 5,224 | 4,702 | 522 | 558 | 941 | 5,352 |
| 1932 | 10,487 | 5,633 | 5,013 | 4,572 | 4,129 | 443 | 441 | 620 | 4,854 |
| 1933 | 12,241 | 6,582 | 5,869 | 5,389 | 4,726 | 663 | 480 | 712 | 5,659 |
| 1934 | 12,549 | 6,797 | 5,838 | 5,602 | 4,947 | 655 | 236 | 959 | 5,752 |
| 1935 | 13,810 | 7,628 | 6,620 | 6,327 | 5,561 | 766 | 293 | 1,008 | 6,182 |
| 1936 | 15,966 | 8,716 | 7,527 | 7,197 | 6,189 | 1,008 | 330 | 1,189 | 7,250 |
| 1937 | 18,286 | 10,394 | 8,895 | 8,368 | 7,364 | 1,004 | 527 | 1,499 | 7,892 |
| 1938 | 14,902 | 9,194 | 7,953 | 7,760 | 6,961 | 799 | 193 | 1,241 | 5,708 |
| 1939 | 17,387 | 10,816 | 9,736 | 9,461 | 8,543 | 918 | 275 | 1,081 | 6,571 |
| 1940 | 18,026 | 13,743 | 12,369 | 12,142 | 10,819 | 1,323 | 227 | 1,374 | 4,283 |
| 1941 | 21,451 | 16,580 | 14,176 | 13,984 | 12,446 | 1,538 | 192 | 1,560 | 4,871 |
| 1942 | 22,259 | 17,275 | 14,907 | 14,753 | 13,056 | 1,697 | 154 | 1,660 | 4,984 |
| 1943 | 20,455 | 15,645 | 13,580 | 13,463 | 11,847 | 1,616 | 117 | 1,355 | 4,810 |
| 1944 | 21,150 | 16,758 | 15,349 | 15,149 | 13,180 | 1,969 | 200 | 1,351 | 4,392 |
| 1945 | 22,795 | 16,912 | 15,254 | 14,851 | 12,772 | 2,079 | 403 | 1,523 | 5,883 |
| 1946 | 25,127 | 17,818 | 16,966 | 16,378 | 14,020 | 2,359 | 588 | 1,675 | 7,309 |
| 1947 | 28,318 | 19,714 | 18,543 | 17,744 | 15,313 | 2,431 | 799 | 1,750 | 8,604 |
| 1948 | 30,297 | 21,189 | 20,026 | 19,061 | 16,697 | 2,364 | 965 | 1,982 | 9,108 |
| 1949 | 28,464 | 19,945 | 17,619 | 16,486 | 14,326 | 2,160 | 1,133 | 1,411 | 8,519 |
| 1950 | 33,659 | 23,627 | 20,716 | 19,466 | 16,679 | 2,787 | 1,250 | 1,385 | 10,032 |
| 1951 | 36,158 | 26,522 | 25,128 | 23,718 | 20,069 | 3,649 | 1,410 | 2,497 | 9,636 |
| 1952 | 35,404 | 26,461 | 25,045 | 23,477 | 20,002 | 3,475 | 1,568 | 2,108 | 8,943 |
| 1953 | 37,774 | 28,141 | 26,322 | 24,787 | 20,707 | 4,080 | 1,535 | 1,541 | 9,633 |
| 1954 | 38,056 | 29,436 | 26,972 | 25,471 | 20,945 | 4,526 | 1,501 | 1,562 | 8,620 |
| 1955 | 41,989 | 33,356 | 30,948 | 28,598 | 23,363 | 5,234 | 2,350 | 1,704 | 8,633 |
| 1956 | 45,448 | 35,749 | 35,196 | 32,146 | 26,212 | 5,934 | 3,050 | 1,762 | 9,699 |
| 1957 | 44,241 | 35,746 | 34,422 | 30,538 | 24,525 | 6,013 | 3,884 | 1,666 | 8,495 |
| 1958 | 43,592 | 35,248 | 33,239 | 28,090 | 22,445 | 5,646 | 5,149 | 1,269 | 8,344 |
| 1959 | 47,895 | 38,691 | 36,716 | 30,583 | 23,380 | 7,202 | 6,134 | 1,055 | 9,204 |
| 1960 | 48,615 | 40,485 | 40,012 | 33,468 | 25,454 | 8,014 | 6,544 | 1,158 | 8,130 |
| 1961 | 50,061 | 42,191 | 40,272 | 32,118 | 23,997 | 8,121 | 8,155 | 1,162 | 7,870 |
| 1962 | 52,535 | 44,070 | 42,772 | 33,811 | 24,866 | 8,945 | 8,961 | 1,292 | 8,465 |
| 1963 | 54,100 | 46,435 | 44,708 | 34,471 | 25,044 | 9,426 | 10,237 | 1,543 | 7,665 |
| 1964 | 58,068 | 50,148 | 49,497 | (2) | (2) | (2) | (2) | 1,391 | 7,920 |
| 1965 [3] | 61,778 | 52,828 | 52,618 | (2) | (2) | (2) | (2) | 1,149 | 8,950 |
| 1966 [3] | 65,220 | 55,400 | 54,500 | 40,500 | 28,800 | 11,700 | 14,000 | 1,043 | 9,820 |

[1] Data may not add to totals because of changes in inventories, rounding, and statistical discrepancies in imports.
[2] Not available.
[3] Preliminary.

Sources: U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board.* Cur. Indus. Rpts. Ser. M26A. Annual; *U.S. imports of merchandise for consumption.* FT 125. Annual; *U.S. exports: commodity by country.* FT 410. Annual.

American Paper Institute, *Monthly statistical summary* (3), New York.
American Pulpwood Association. *Pulpwood statistics.* New York. Annual.
U.S. Department of Agriculture, Forest Service.

TABLE 2.—*Pulpwood consumed in the manufacture of wood pulp in the United States, by type of pulp produced, specified years 1947–64* [1]

| Pulping process | 1947 | | | 1954 | | | 1958 | | | 1963 | | | 1964[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production |
| | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | |
| | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* |
| Dissolving and special alpha | 5,610 | 2.01 | 2,796 | 1,590 | 2.09 | 760 | 1,727 | 1.86 | 929 | 3,040 | 2.22 | 1,371 | 3,196 | 2.19 | 1,457 |
| Sulfite | | | | 4,674 | 1.96 | 2,383 | 4,683 | 1.97 | 2,381 | [3] 6,635 | [3] 2.15 | [3] 3,080 | [3] 6,232 | [3] 2.05 | [3] 3,036 |
| Sulfate | 9,489 | 1.77 | 5,357 | 17,664 | 1.80 | 9,812 | 21,193 | 1.72 | 12,316 | 28,644 | 1.60 | 17,941 | 32,327 | 1.62 | 20,006 |
| Soda | 957 | 1.95 | 492 | 819 | 1.90 | 430 | 572 | 1.33 | 429 | (3) | (3) | (3) | (3) | (3) | (3) |
| Groundwood | 2,009 | .98 | 2,050 | 2,546 | 1.02 | 2,485 | 2,640 | .91 | 2,890 | 3,753 | 1.08 | 3,468 | 3,606 | 1.00 | 3,596 |
| Semichemical | 1,281 | 1.02 | 1,252 | 1,353 | 1.13 | 1,198 | 1,564 | .96 | 1,622 | 2,900 | 1.10 | 2,629 | 2,831 | 1.04 | 2,712 |
| Defibrated and exploded [4] | | | | 1,033 | .87 | 1,189 | 966 | .79 | 1,228 | 1,464 | .90 | 1,632 | 1,517 | .94 | 1,621 |
| Total | 19,345 | 1.62 | 11,946 | 29,679 | 1.63 | 18,256 | [5] 35,144 | 1.61 | 21,796 | 46,435 | 1.54 | 30,121 | 49,711 | 1.53 | 32,429 |

[1] Data may not add to totals because of rounding.

[2] Preliminary.

[3] Soda included in sulfite.

[4] Includes chemical and mechanical screenings.

[5] Includes 1,799 thousand cords not reported by pulping process.

Sources: U.S. Department of Commerce, Bureau of the Census. *Census of manufacturcs: 1947, 1954; 1958.* MC–26A; and *Pulp, paper and board.* U.S. Department of Agriculture, Forest Service.

TABLE 3.—*Pulpwood consumed in the manufacture of wood pulp in the United States, by type of pulp produced, 1920–62* [1]

| Year | Total | | | Sulfite [2] | | | Sulfate [2] | | | Soda | | | Groundwood | | | Semichemical | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production |
| | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | |
| | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* |
| 1920 | 6,114 | 1.60 | 3,822 | 3,202 | 2.02 | 1,586 | 397 | 2.10 | 189 | 924 | 2.00 | 463 | 1,591 | 1.00 | 1,584 | -- | -- | -- |
| 1921 | 4,557 | 1.58 | 2,876 | 2,368 | 2.07 | 1,142 | 292 | 2.12 | 138 | 610 | 2.03 | 301 | 1,287 | 1.02 | 1,260 | -- | -- | -- |
| 1922 | 5,549 | 1.58 | 3,522 | 2,765 | 2.01 | 1,374 | 503 | 2.06 | 244 | 787 | 1.87 | 420 | 1,494 | 1.01 | 1,484 | -- | -- | -- |
| 1923 | 5,873 | 1.55 | 3,789 | 2,864 | 2.03 | 1,411 | 605 | 1.94 | 312 | 836 | 1.88 | 445 | 1,568 | 1.00 | 1,568 | -- | -- | -- |
| 1924 | 5,768 | 1.55 | 3,723 | 2,691 | 2.01 | 1,337 | 626 | 2.07 | 303 | 807 | 1.83 | 441 | 1,644 | 1.00 | 1,643 | -- | -- | -- |
| 1925 | 6,094 | 1.54 | 3,962 | 2,848 | 2.03 | 1,403 | 810 | 1.98 | 410 | 865 | 1.83 | 473 | 1,571 | .97 | 1,612 | -- | -- | -- |
| 1926 | 6,766 | 1.54 | 4,395 | 3,144 | 2.02 | 1,558 | 996 | 1.92 | 520 | 901 | 1.81 | 497 | 1,726 | .98 | 1,764 | -- | -- | -- |
| 1927 | 6,751 | 1.57 | 4,313 | 3,095 | 1.99 | 1,553 | 1,177 | 1.95 | 603 | 901 | 1.85 | 487 | 1,566 | .97 | 1,610 | 12 | 1.00 | 12 |
| 1928 | 7,160 | 1.59 | 4,511 | 3,197 | 2.05 | 1,559 | 1,435 | 1.85 | 774 | 928 | 1.90 | 489 | 1,559 | .97 | 1,611 | 41 | 1.37 | 30 |
| 1929 | 7,645 | 1.57 | 4,863 | 3,402 | 2.01 | 1,689 | 1,701 | 1.87 | 911 | 925 | 1.78 | 521 | 1,560 | .95 | 1,638 | 57 | 1.43 | 40 |
| 1930 | 7,196 | 1.55 | 4,630 | 3,135 | 2.00 | 1,567 | 1,693 | 1.78 | 950 | 850 | 1.79 | 474 | 1,468 | .94 | 1,560 | 50 | 1.67 | 30 |
| 1931 | 6,723 | 1.52 | 4,409 | 2,782 | 1.96 | 1,418 | 1,771 | 1.71 | 1,033 | 686 | 1.83 | 374 | 1,371 | .95 | 1,449 | 113 | 1.30 | 87 |
| 1932 | 5,633 | 1.50 | 3,760 | 2,151 | 1.88 | 1,146 | 1,709 | 1.66 | 1,029 | 528 | 1.81 | 291 | 1,144 | .95 | 1,203 | 101 | 1.51 | 67 |
| 1933 | 6,582 | 1.54 | 4,276 | 2,568 | 1.93 | 1,328 | 2,118 | 1.68 | 1,259 | 665 | 1.71 | 388 | 1,110 | .93 | 1,198 | 120 | 1.71 | 70 |
| 1934 | 6,797 | 1.53 | 4,436 | 2,839 | 1.96 | 1,446 | 2,024 | 1.62 | 1,246 | 631 | 1.78 | 354 | 1,203 | .93 | 1,297 | 99 | 1.74 | 57 |
| 1935 | 7,628 | 1.55 | 4,926 | 3,112 | 1.97 | 1,580 | 2,426 | 1.65 | 1,468 | 709 | 1.70 | 418 | 1,266 | .93 | 1,356 | 114 | 1.70 | 67 |
| 1936 | 8,716 | 1.53 | 5,695 | 3,484 | 1.91 | 1,822 | 2,940 | 1.64 | 1,795 | 796 | 1.66 | 479 | 1,366 | .93 | 1,476 | 130 | 1.65 | 79 |
| 1937 | 10,394 | 1.58 | 6,573 | 4,318 | 2.02 | 2,140 | 3,562 | 1.67 | 2,139 | 893 | 1.76 | 508 | 1,480 | .92 | 1,601 | 142 | 1.07 | 133 |
| 1938 | 9,194 | 1.55 | 5,934 | 3,090 | 1.92 | 1,606 | 4,026 | 1.65 | 2,443 | 718 | 1.82 | 395 | 1,219 | .91 | 1,333 | 141 | 1.18 | 119 |
| 1939 | 10,816 | 1.55 | 6,993 | 3,689 | 1.90 | 1,946 | 4,859 | 1.64 | 2,963 | 764 | 1.73 | 442 | 1,316 | .91 | 1,445 | 188 | 1.24 | 152 |
| 1940 | 13,743 | 1.53 | 8,960 | 4,966 | 1.90 | 2,608 | 5,975 | 1.59 | 3,748 | 979 | 1.84 | 532 | 1,609 | .99 | 1,633 | 214 | 1.30 | 165 |
| 1941 | 16,580 | 1.60 | 10,375 | 5,546 | 1.90 | 2,919 | 7,197 | 1.59 | 4,527 | 883 | 1.84 | 480 | -- | -- | -- | -- | -- | -- |
| 1942 | 17,275 | 1.60 | 10,783 | 5,568 | 1.90 | 2,930 | 7,534 | 1.59 | 4,738 | 850 | 1.84 | 462 | -- | -- | -- | -- | -- | -- |
| 1943 | 15,645 | 1.62 | 9,680 | 4,629 | 1.90 | 2,437 | 6,735 | 1.59 | 4,236 | 771 | 1.84 | 419 | -- | -- | -- | -- | -- | -- |
| 1944 | 16,758 | 1.66 | 10,108 | 4,796 | 2.01 | 2,386 | 8,051 | 1.77 | 4,549 | 805 | 1.95 | 413 | -- | -- | -- | -- | -- | -- |
| 1945 | 16,912 | 1.66 | 10,167 | 4,743 | 2.01 | 2,360 | 7,915 | 1.77 | 4,472 | 838 | 1.94 | 430 | -- | -- | -- | -- | -- | -- |
| 1946 | 17,818 | 1.68 | 10,607 | 4,978 | 2.01 | 2,476 | 8,121 | 1.77 | 4,588 | 929 | 1.95 | 476 | -- | -- | -- | -- | -- | -- |
| 1947 | 19,714 | 1.65 | 11,946 | 5,610 | 2.01 | 2,796 | 9,489 | 1.77 | 5,357 | 957 | 1.95 | 492 | -- | -- | -- | -- | -- | -- |
| 1948 | 21,189 | 1.65 | 12,872 | 5,651 | 2.01 | 2,811 | 10,644 | 1.77 | 6,014 | 994 | 1.95 | 510 | -- | -- | -- | -- | -- | -- |
| 1949 | 19,945 | 1.63 | 12,207 | 5,098 | 2.01 | 2,536 | 10,580 | 1.77 | 5,977 | 960 | 1.95 | 492 | -- | -- | -- | -- | -- | -- |
| 1950 | 23,627 | 1.59 | 14,849 | 5,716 | 2.01 | 2,844 | 13,288 | 1.77 | 7,506 | 1,018 | 1.95 | 522 | -- | -- | -- | -- | -- | -- |
| 1951 | 26,522 | 1.61 | 16,524 | 6,081 | 1.98 | 3,066 | 15,586 | 1.80 | 8,647 | 852 | 1.91 | 446 | -- | -- | -- | -- | -- | -- |
| 1952 | 26,461 | 1.61 | 16,473 | 5,863 | 1.99 | 2,952 | 15,672 | 1.80 | 8,687 | 813 | 1.91 | 425 | -- | -- | -- | -- | -- | -- |
| 1953 | 28,141 | 1.60 | 17,537 | 5,678 | 1.98 | 2,861 | 17,301 | 1.81 | 9,584 | 817 | 1.91 | 428 | -- | -- | -- | -- | -- | -- |
| 1954 | 29,436 | 1.62 | 18,256 | 5,998 | 1.99 | 3,016 | 18,025 | 1.81 | 9,985 | 819 | 1.90 | 430 | -- | -- | -- | -- | -- | -- |
| 1955 | 33,356 | 1.61 | 20,740 | 6,463 | 1.99 | 3,251 | 20,922 | 1.81 | 11,577 | 841 | 1.91 | 440 | -- | -- | -- | -- | -- | -- |
| 1956 | 35,749 | 1.62 | 22,131 | 6,640 | 1.99 | 3,344 | 22,421 | 1.81 | 12,411 | 914 | 1.91 | 479 | -- | -- | -- | -- | -- | -- |
| 1957 | 35,746 | 1.64 | 21,800 | 6,317 | 2.02 | 3,131 | 21,826 | 1.76 | 12,390 | 724 | 1.69 | 428 | -- | -- | -- | -- | -- | -- |
| 1958 | 35,248 | 1.62 | 21,796 | 5,776 | 2.01 | 2,867 | 22,463 | 1.76 | 12,760 | 725 | 1.69 | 429 | -- | -- | -- | -- | -- | -- |
| 1959 | 38,691 | 1.59 | 24,383 | 6,168 | 2.02 | 3,051 | 25,293 | 1.76 | 14,357 | 812 | 1.69 | 481 | -- | -- | -- | -- | -- | -- |

TABLE 3.—*Pulpwood consumed in the manufacture of wood pulp in the United States, by type of pulp produced, 1920–62* [1]—Continued

| Year | Total | | | Sulfite[2] | | | Sulfate[2] | | | Soda | | | Groundwood | | | Semichemical | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production | Pulpwood consumption | | Wood pulp production |
| | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | | Total | Per ton of pulp produced | |
| | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* | *Thousand cords* | *Cords* | *Thousand tons* |
| 1960 | 40,485 | 1.60 | 25,316 | 6,644 | 2.03 | 3,272 | 26,421 | 1.76 | 15,034 | 709 | 1.69 | 420 | -- | -- | -- | -- | -- | -- |
| 1961 | 42,191 | 1.59 | 26,523 | 6,717 | 2.03 | 3,303 | 27,921 | 1.76 | 15,888 | 737 | 1.69 | 436 | -- | -- | -- | -- | -- | -- |
| 1962 | 44,070 | 1.58 | 27,908 | 6,832 | 2.04 | 3,350 | 29,485 | 1.76 | 16,782 | 718 | 1.69 | 425 | -- | -- | -- | -- | -- | -- |

[1] Data may not add to totals because of rounding and the inclusion in the totals of pulpwood and wood pulp not shown separately by pulping process.

[2] Includes dissolving and special alpha pulps.

Sources: U.S. Department of Commerce, Bureau of the Census. *Pulp, paper and board;* United States Pulp Producers Association, Inc. *Wood pulp statistics.* New York, 1963. Annual; and U.S. Department of Agriculture, Forest Service.

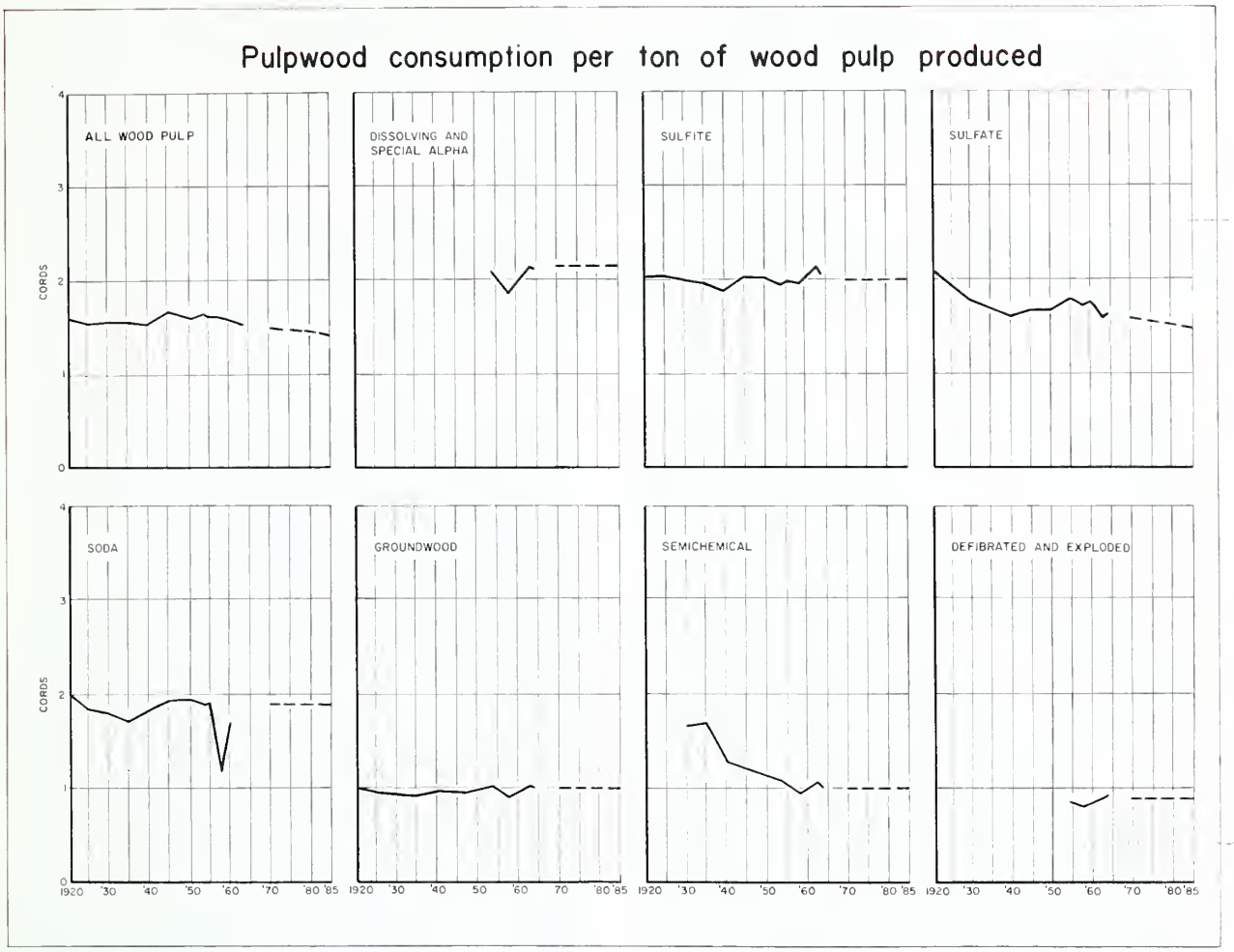
Pulpwood consumption per ton of wood pulp produced
ALL WOOD PULP
DISSOLVING AND SPECIAL ALPHA
SULFITE
SULFATE
SODA
GROUNDWOOD
SEMICHEMICAL
DEFIBRATED AND EXPLODED
CORDS
CORDS
0
1
2
3
4
1920
'30
'40
'50
'60
'70
'80
'85

FIGURE 1.

# APPENDIX H

## Definition of Terms

[Note: All definitions for grades of paper and board and wood pulp shown in this appendix were taken from or based on definitions in *The dictionary of paper.* New York: American Paper Institute, 2d ed. 1951 and 3d ed. 1965. Definitions of statistical terms were taken from or based on material in *Methods of correlation and regression analysis.* Mordecai Ezekiel and Karl A. Fox. New York: John Wiley and Sons. 1959.]

*Bending board:* Includes (a) *Folding boxboard.* A paperboard used for the manufacture of collapsible or folding cartons. Bending board is made of wood pulp, waste papers, or a combination of these, and may be unlined, single vat lined, or coated. It is made in thicknesses of 0.013 to 0.052 of an inch and in weights from 60 to 180 pounds per 1,000 square feet. It possesses bending qualities and usually has a finish to permit printing or lithographing colored designs. This group includes such products as bending chipboard, clay-coated boxboard, mist gray suit board, single manila-lined chip, solid (or filled) newsboard, and white patent-coated news. (b) *Special food board.* A general term applied to paperboards used in the packaging of milk, frozen foods, other similar foods, and as containers for hot and cold drinks. Includes milk container stock; cup stock; ice cream and food pail stock; plate, dish, and tray stock; frozen food container stock; and other similar boards.

*Board.* (See paperboard.) In addition to the grades classified by the Bureau of the Census as paperboard, the term as used in this study includes wet machine board and building board.

*Book paper.* A general term used to define a class or group of papers having in common physical characteristics that, in general, are most suitable for the graphic arts, exclusive of newsprint. These physical characteristics are varied to meet the requirements of the type of impress employed and the objective use of the article produced.

*Building board.* A general term describing paperboard used by the building trades. In this report it is used as the general term for hardboard and insulating board.

*Chipboard.* A paperboard used for many purposes that may or may not have specifications of strength, color, or other characteristics. Chipboard is normally made from paper stock with a relatively low density in thicknesses of 0.006 of an inch and up. Lightweight grades are made on both the Fourdrinier and cylinder machines, the heavier weights on cylinder machines only. It may be a filled sheet or a solid sheet: (a) Combination chipboard has paper stock as a base or center and is vat lined on one or both sides with a different grade or stock—usually of a higher grade and possessing a smoother and better appearing surface. News grade of mechanical pulp, blank news, etc., are used for the vat liner. (b) Solid chipboard is unlined and is made of paper stock throughout.

*Chips.* Small pieces of wood produced by a chipper in a form suitable for processing into wood pulp.

*Coarse paper.* A term applied to various grades of paper used for industrial purposes as opposed to grades used for cultural purposes. They can be bleached or unbleached, usually range from a basis weight of 18 pounds or more (24 x 36—500), and frequently are colored or printed, or both. Grades falling under this classification include wrapping papers, bag papers, gummed tapes, building papers, heavy duty envelopes, towels, etc. See also industrial paper.

*Coated book paper.* A paper used in the manufacture of magazines, books, pamphlets, folders, and brochures where the use of fine halftone illustrations is necessary. The materials used and the process of manufacture of the base paper are the same as for uncoated book paper. Coated book paper is well sized and possesses good tearing strength. The base paper is coated with white mineral pigment mixed with adhesive, such as casein, starch, latex, resin, or glue, either on the paper machine as a part of the process of manufacture or as a separate operation after manufacture of the base paper. Waxes or soaps may also be added to the coating mixtures to add to the finish and feel of the paper. The mineral pigments used include clay, satin white, barium sulfate, calcium carbonate, calcium sulfite, and titanium dioxide, which may be applied as such or as mixtures.

*Coefficient of autocorrelation.* A measure of the correlation between each item of a series and an item of the same series that follows next in time. A coefficient of autocorrelation that differs significantly from zero means that the basic conditions of simple sampling have probably not been met.

*Coefficient of correlation.* A measure of the relationship between two variables when the relationship is linear.

*Coefficient of determination.* A measure of the percent of change in the values of the dependent variable, which is associated with changes in the values of the independent variable when the relationship is linear.

*Coefficient of multiple correlation.* A measure of the relationship between a dependent variable and two or more independent variables when the relationship is linear.

*Coefficient of multiple determination.* A measure of the percent of change in the values of the dependent variable, which is associated with changes in the values of two or more independent variables when the relationship is linear.

*Coefficient of partial correlation.* A measure of the extent to which an independent variable explains changes in the dependent variable after all other independent variables are taken into account. Ezekiel and Fox define it as follows:[1] "The coefficient of partial correlation may be defined as a measure of the extent to which that part of the variation in the dependent variable that was *not* explained by the other independent factors can be explained by the addition of a new factor."

*Coefficient or index of partial correlation.* A measure of the extent to which an independent variable explains changes in the dependent variable after all other independent variables in the regression equations are taken into account.

*Construction paper* (*building paper*). A general term applied to a class of paper used in general construction work. These papers are generally produced from strong fibers (rags, wool, screenings, and unbleached kraft pulp). They are used in building construction for sheathing and under flooring and may be converted to such products as roofing, sheathing, and tarred or asphalt-coated vapor barrier.

*Container board.* A general term designating: (1) Solid fiber or corrugated combined board used in the manufacture of shipping containers and related products; (2) the component materials used in the fabrication of corrugated board and solid fiber combined board, i.e., liner-board, corrugating medium, and chipboard.

[1] Ezekiel and Fox, op. cit., p. 193.

*Correlation model.* The correlation model requires strictly random samples from normal bivariate or multivariate universes. In contrast, the *regression model* has no requirement concerning the universe—if indeed a "natural" underlying universe exists at all.

*Cover papers.* A term applied to a great variety of papers used for the outside covers of catalogs, brochures, and booklets to enhance the appearance and to provide protection from handling, and for other printed matter in which substantial weight or bulk is important.

*Defibrated pulp.* A pulp produced mechanically by means of a machine known as a defibrator. In this process, wood chips are continuously fed into a steam-heated chamber, and the mechanical separation of the fibers then takes place at elevated temperatures. Hardwoods or softwoods may be used in the manufacturing process. The yield is high, ranging from 90 to 95 percent on a bonedry basis. The resulting pulp is homogeneous and free and has good felting properties. Defibrated pulps are used principally in the manufacture of hardboard, insulating board, and roofing felt.

*Exploded pulp.* A pulp produced from almost any kind of wood by subjecting the chips to a very high steam pressure for a short time, usually less than a minute. Sudden release of the pressure produces a violent internal explosion in the cell spaces of the wood, tearing the fibers apart and reactivating the lignin so that it can form a new bond with the fibers. The resulting pulp is brown in color and is used in the manufacture of a hard board suitable for use as a building and insulating material and as a substitute for metals or lumber in the manufacture of a wide range of industrial products.

*Fine paper.* A general term including writing, bristols, cover, text, and thin papers. Most fine paper is made from chemical pulp, largely sulfite and bleached sulfate although rag pulps are used in producing certain specialty grades, such as bond, currency, ledger, and map.

*Folding boxboard.* A paperboard used for the manufacture of collapsible or folding cartons. It is made of wood pulp, waste papers, or a combination of these and may be unlined, single vat lined, or coated. It is made in thicknesses of 0.013 to 0.052 of an inch and in weights from 60 to 80 pounds per 1,000 square feet. It possesses bending qualities and usually has a finish to permit printing or lithographing colored designs. This group includes such products as bending chipboard, clay-coated boxboard, mist gray suit board, single manila-lined chip, solid (or filled) newsboard, and white patent-coated news.

*Furnish.* The mixture of various materials that are blended in the stock suspension from which paper or board is made. The chief con-

stituents are the fibrous material (pulp), sizing materials, wet strength or other additives, fillers, and dyes.

*Groundwood paper.* A general term applied to a variety of papers made with substantial proportions of mechanical wood pulp together with chemical wood pulps, and used mainly for printing and converting purposes.

*Groundwood pulp.* The pulp produced by taking short logs after they have been barked and cleaned, and pressing these logs sideways against a revolving natural or artificial pulpstone, thereby reducing them to a fibrous mass of short fibers, which discolors in time on exposure to light and air. The wood is almost always softwoods, although in certain pulp hardwoods are used. Freedom from pitch is desirable. Groundwood pulp is used in papers where permanence and strength are of minor importance, but where absorbency, bulk, opacity, and compressibility are the chief characteristics desired.

*Hardboard.* A board manufactured from wood or other lignocellulose fibers, refined or partly refined, and felted into a panel having a density range of over 26 pounds per cubic foot under carefully controlled optimum combinations of consolidating pressure, heat, and moisture so that the board produced has a characteristic natural ligneous bond.

*Income elasticity of demand.* The percentage change in quantity demanded resulting from a 1-percent change in income when other factors, such as prices, are held constant.

*Index of correlation.* A measure of the relationship between two variables when the relationship is curvilinear.

*Index of determination.* A measure of the percent of change in the values of the dependent variable, which is associated with changes in the values of the independent variable when the relationship is curvilinear.

*Index of multiple correlation.* A measure of the relationship between a dependent variable and two or more independent variables when the relationship is curvilinear.

*Index of multiple determination.* A measure of the percent of change in the values of the dependent variable, which is associated with changes in the values of two or more independent variables when the relationship is curvilinear.

*Industrial paper.* A general term including cable paper, tabulating card stock, tag stock, blotting paper, filter paper, and other special industrial and absorbent papers used for industrial purposes.

*Insulation board (insulating board).* A type of board composed of a fibrous material, such as wood or other vegetable fiber, sized throughout, and felted or pressed together so as to contain a large quantity of entrapped or "dead" air and having a density of 26 pounds or less per cubic foot. It is made either by cementing together several thin layers or forming a nonlaminated layer of the required thickness. It is used in plain or decorative finishes for interior walls and ceilings in thicknesses of 0.5 and 1 inch (in some cases up to 3 inches) and also as a water-repellent finish for house sheathing.

*Newsprint.* A generic term to describe paper generally used in the publication of newspapers. The furnish is largely mechanical wood pulp, with some chemical wood pulp. The paper is machine finished and slack sized, and it has little or no mineral loading. It is made in basis weights varying from 30 to 35 pounds (24 x 36—500), the great preponderance being 32 pounds. The term includes standard newsprint and also paper generally similar to it and used for the same purpose but which may exceed to slight degrees the limitations of weight, finish, sizing, and ash applicable to standard newsprint. It does not include printing papers of types generally used for purposes other than newspapers, even though such papers may to some extent be used by newspapers.

*Paper.* (1) General term. The name for all kinds of matted or felted sheets of fiber (usually vegetable but sometimes mineral, animal, or synthetic), formed on a fine wire screen from a water suspension. Paper derives its name from papyrus, a sheet made by pasting together thin sections of an Egyptian reed (*Cyperus papyrus*) and used in ancient times as writing material. (2) Specific term. One of the two broad subdivisions of paper (general term), the other being board. The distinction between paper and board is not sharp but, generally speaking, paper is lighter in basis weight, thinner, and more flexible than board. Its largest uses are for printing, writing, wrapping, and sanitary purposes, although it is also employed for a very wide variety of other uses.

*Paperboard.* One of the two broad subdivisions of paper (general term), the other being paper (specific term). The distinction between paperboard and paper is not sharp but broadly speaking, paperboard is heavier in basis weight, thicker, and more rigid than paper. In general, all sheets 12 points (0.012 inch) or more in thickness are classified as paperboard. There are a number of exceptions based upon traditional nomenclature. For example, blotting paper, felts, and drawing paper in excess of 12 points are classified as paper while corrugating medium, chipboard, and linerboard less than 12 points are classified as paperboard. Paperboard is made from a wide variety of furnishes on a number of types of machines, principally

cylinder and Fourdrinier. The broad classes are: (1) container board, which is used for corrugated cartons, (2) boxboard, which is further divided into (a) folding boxboard, (b) special food board, (c) setup boxboard, and (3) all other special types, such as automobile board, building board, tube board, etc.

*Pulpwood.* The wood used in the manufacture of wood pulp.

*Regression model.* A model in which the values of the independent variable or variables are selected by the analyst as typical, with no requirement that the distributions of the variables in the sample be representative of those in the universe—if indeed a "natural" underlying universe exists at all. This is in contrast to the *correlation model* that requires strictly random samples from normal bivariate or multivariate universes.

*Sanitary and tissue paper.* A general term indicating a class of papers of characteristic gauzy texture and sometimes fairly transparent, made in weights lighter than 18 pounds (24 x 36—500). In addition to sanitary tissues, they include wrapping tissue, waxing tissue stock, twisting tissue stock, fruit and vegetable wrapping tissue stock, and crepe wadding. They are made on any type of paper machine and from any type of pulp or sometimes from waste paper. They may be glazed or unglazed and are used for a wide variety of purposes.

*Screenings.* Screenings are produced from the coarse fibers, fiber bundles, shives, partially cooked chips, and other materials removed from unbleached wood pulp in the screening operation. After separation by screening, it is the usual practice for the pulp mill partially to defiber this material by mechanical means, such as a jordan or other refiner, before running it into laps or sheets. Screenings are used principally in the manufacture of coarse grades of paper and paperboard, such as mill wrapper, and as a substitute for chipboard, corrugating material, and insulation board. Screenings are produced in all the chemical pulping processes, but normally only the screenings from the sulfate, and acid and neutral sulfite processes are used commercially. Groundwood screenings are occasionally refined and admixed with virgin stock and may be used in the coarsest grades of board.

*Semichemical pulp.* Semichemical pulp is so-called because only a part of the ligneous part of the wood is removed during cooking, and consequently, high yields are obtained from this process. The term "semichemical" indicates a relatively mild degree of cooking, such as a quick-cook sulfite or sulfate cook, and is not specific to any of the chemical pulping processes. After cooking, the softened chips are mechanically disintegrated by a suitable refiner. Although some semichemical pulp is now being bleached by the peroxide method for use in the manufacture of printing papers, this type of pulp is chiefly used in the unbleached state, and is characterized by a relatively low color (dependent upon the wood used) and yields a sheet of paper or board that has a dense formation and a high degree of stiffness and rigidity.

*Setup boxboard.* A general term for paperboard used in making boxes in rigid form as contrasted with a folding or collapsible box. It may be a solid or combination board depending on the style of box; it ranges in thickness from 0.016 to 0.065 of an inch and weighs 60 to 206 pounds per 1,000 square feet. Stiffness, rigidity, and resistance to abuse are essential qualities.

*Soda pulp.* The term used for the pulp in which the active cooking agent is caustic soda, the digestion taking place at fairly high temperatures. Soda pulp is made principally from broadleaf woods, such as aspen, birch, maple, gum, and tulip poplar. When bleached, it reaches a fairly white color. In general, owing to the natural shortness of the fiber (1 to 1.5 mm.), it possesses very little physical strength but imparts the desirable properties of smoothness, bulk, opacity, and uniform formation for printing requirements. Some soda pulp is also made from coniferous woods. This pulp is soft in texture and is stronger than that produced from broadleaf woods.

*Special food board.* A general term applied to paperboards used in the packaging of milk, frozen foods, other similar foods, and as containers for hot and cold drinks. Includes milk container stock; cup stock; ice cream and food pail stock; plate, dish, and tray stock; frozen food container stock; and other similar boards.

*Standard error of estimate.* A measure of the closeness with which values of a dependent variable can be estimated from the values of independent variables. According to Ezekiel and Fox: [2] "The standard error of estimate can be used to indicate the probable reliability of a series of estimates of the values of the dependent variable for new observations when only the values of the independent variable are known, but only where it is definitely known that the new cases are drawn at random from exactly the same universe—as were the observations from which the relation was determined. In case they do not represent exactly the same conditions—as if, for example, they represent a different period of time—then the standard error of estimate has meaning only with respect to the scatter of the residuals around the regression line *for the cases used*

[2] Ezekiel and Fox, op. cit.

*in determining the relationship.* The standard error of estimate is stated in the same unit as the original independent variable. Where the dependent variable is in pounds, the standard error of estimate will be in pounds, where it is in tons, the standard error will be in tons, and where it is in logarithms, the standard error will be in logarithms."

*Standard error of forecast.* The standard error applicable to estimates of the most probable values of the dependent variable calculated from new observations of the independent variable.

*Sulfate pulp.* A term commonly used for all grades of pulp cooked by the process in which the makeup chemical is essentially sodium sulfate. Originally, sulfate pulps were used for the most part in the manufacture of various grades of paper and paperboard where physical strength was of primary importance. However, increasing amounts of sulfate pulps are being used for absorbent tissues, wadding, and for chemical conversion grades. Although the stronger grades are made from softwoods, very large quantities of hardwood kraft pulps are produced.

*Sulfite pulp.* Although some bleached sulfite is made from hardwoods, it is usually manufactured from coniferous woods of low resin content, such as spruce, balsam, fir and hemlock, by dissolution of the ligneous material (lignin) with calcium bisulphite cooking acid. Dolomite limes, containing a fair percentage of magnesium along with the calcium, are sometimes used when economical. Sulfite pulp is used either bleached or unbleached in nearly all classes of papers, and bleached sulfite pulp is used in the manufacture of rayon and cellulose esters and ethers.

*Tests of significance—t-test and F-test.* Tests to determine the probability of a difference between measures being due to chance.

*Text papers.* A paper of fine quality and texture for printing. Text papers are manufactured in white and colors, from bleached chemical wood pulp or cotton fiber content furnishes with a deckled or plain edge, and are sometimes watermarked. Designed for advertising printing, the principal use of text papers is for booklets, brochures, fine books, announcements, annual reports, menus, folders, and the like.

*Thin papers.* Any lightweight paper. The term is usually applied to such papers as Bible, carbonizing, cigarette, condenser, manifold, and like papers, but not to facial or toilet tissue.

*t-ratio.* A measure of the probability that the given value of $b$ might have been obtained by chance from a population in which the true regression coefficient is zero.

*Uncoated book paper.* An uncoated paper used in the manufacture of printed material, such as magazines, books, pamphlets, folders, and brochures, or converted products, such as envelopes, tablets, adding machine paper, box lining, trading stamps, etc. The furnishes used are generally various combinations of bleached chemical wood pulps.

*Wet machine board.* Certain types of boards manufactured on a wet machine, which are dried and finished; among these are binders, book, coaster, counter, dobby, electrical pressboard, filter friction, fuller, genuine pressboard, heeling, innersole, leather, matrix, middlesole, panel, shank, shoe, and trunk fiberboard.

*Wood pulp.* Wood pulp is pulp manufactured either by mechanical or chemical means or both from softwood or hardwood trees. It is used as part or all of the fiber composition in practically every type of paper and constitutes approximately 90 percent of the virgin pulp fiber used by the world's paper and board industry. In addition to its use by the paper and board industry, bleached and purified chemical wood pulp is widely employed for rayon and other products involving a chemical conversion of the cellulose fiber.

*Writing papers.* A paper suitable for pen and ink, pencil, typewriter, or printing. It is made in a wide range of qualities from chemical and mechanical wood and rag pulp, or mixtures of rag and chemical pulp or chemical and mechanical pulp. It is made in basis weights of 13 to 24 pounds (17 x 22—500). The most significant class property is good writing and ruling surface. For some uses, good strength and erasability are also necessary.

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